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No. 1

NEW PARASITIC MITES OF THE GENUS LAELAPS.

BY H. E. EWING, *U. S. Bureau of Entomology.*

The genus *Laelaps* Koch, in its restricted sense, may be defined as follows: Gamasid mites in which the chelicerae are toothed, and always, in the case of the female, bear a seta on the fixed arm. Ventral plates of the female consisting of a large sternal plate, a genito-epigastric plate of varying size but frequently large and extending to the anal plate, an anal plate which is always provided with two paired and one unpaired anal setae. Dorsal shield in both sexes undivided. Genital opening of male at the anterior margin of sternum; of female in front of genito-epigastric plate and not provided with an epigynum. All members of the genus are parasitic on vertebrates, especially ground burrowing or ground nesting mammals. In the following paper nine new species are described. These species are separated as follows:

KEY TO THE SPECIES OF LAELAPS DESCRIBED IN THIS PAPER.

1. Body almost as broad as long, subdiscal; sternal pores broad openings, not mere slits; sternal setae heavy spines.....*L. hollisteri*, new species.
Body considerably longer than broad; sternal pores either slit-like or apparently wanting.....2.
2. Each chelicera with a brush of long setae just below the attachment of the movable arm.....*L. barbatus*, new species.
No brush of setae on chelicera.....3.
3. Anal plate fully twice as long as broad; anus very large, its greatest diameter being almost equal to the width of anal plate.....
L. braziliensis, new species.
Anal plate never more than one and a half times as long as broad and the greatest diameter of anus not more than equal to one-half of the width of anal plate.....4.
4. First pair of coxae with a pair of large tooth-like spines on posterior side.....*L. wetmorei*, new species.
First pair of coxae without a pair of tooth-like spines.....5.
5. Legs very stout; femur I as broad as long.....*L. rubustipes*, new species.
Legs more slender; femur I much longer than broad.....6.
6. Coxa II with a tooth-like spine on its anterior margin.....
L. californicus, new species.

- Coxa II without a tooth-like spine.....7.
7. Body with well developed shoulders opposite the second coxae.....
L. glasgowi, new species.
 Body without shoulders, the lateral margins opposite the second coxae
 being evenly curved.....8.
8. Seta on chelicera greatly inflated near its base.....*L. virginianus*, new species.
 Seta on chelicera not inflated.....*L. reithrodontis*, new species.

***Laelaps hollisteri*, new species.**

Female.—Large, stout, brownish and rather heavily spined. Chelicerae small for such a large species; fixed chela shorter than the movable one, with three teeth and a simple seta about as long as the chela itself; movable chela with three teeth, two lateral and one terminal. First pair of anterior apical setae, straight, parallel; second pair, marginal and strongly recurved; third pair as close together as second pair but much longer and more strongly recurved. Body setae short, stiff, but not stout spines. Sternal plate about twice as broad as long, front margin almost straight but hind margin strongly arched, anterior corners produced into long cusps. Front pair of sternal pores broad, open, situated approximate and posterior to first pair of sternal setae; second pair of sternal pores smaller than the first pair and situated inside and slightly posterior to the second sternal setae. Sternal setae, stout, spine-like; first pair slightly smaller than the other two pairs; second pair not exactly between the first and third pairs. Genito-epigastric plate rather small and poorly chitinated, falling far short of anal plate. Anal plate triangular, slightly longer than broad; anus situated about its greatest diameter from the anterior margin; paired anal setae subequal to unpaired anal seta, situated slightly in front of posterior margin of anus; unpaired anal seta situated about half the distance from the anus to tip of anal plate. Legs very short and stout; first pair but slightly longer than second pair.

Length, 0.83 mm.; width, 0.65 mm.

Male.—Unknown.

Type host and type locality.—*Peromyscus californicus* sent to National Zoological Park from San Francisco, California.

Type slide.—Cat. No. 900, U. S. N. M.

Described from six females taken from members of the host species kept in a cage at the office of N. Hollister, superintendent of the National Zoological Park at Washington, District of Columbia. This species is of the general type of *L. agilis* Koch and *L. peruviana* Banks, but is much broader than either of these two described species, has a sternal plate of an entirely different shape and differs from them in several other characters.

***Laelaps barbatus*, new species.**

Female.—A stout species with short legs. Chelicerae peculiar in that each has a brush of five setae situated just behind the articulation of the movable chela and on the opposite side from this brush a single large spine-like seta. Sternal plate almost twice as broad as long; each anterior corner produced into

a long slender process which extends to the base of the first coxa. Sternal pores are diagonal slits of equal length; the first pair is immediately behind the first pair of sternal setae and the second pair is immediately behind the second pair of sternal setae. Sternal setae subequal, arranged into two divergent longitudinal rows. Genito-epigastric plate longer than broad and not as broad as the space between the posterior coxae; with six setae, all marginal and the last pair situated at the posterior corners of the genito-epigastric plate. Anal plate broadly and evenly rounded in front and much prolonged posteriorly. Anus small, situated slightly less than its greater diameter from the anterior margin of anal plate; paired anal setae slightly smaller than the unpaired seta and situated slightly in front of the posterior margin of anus; unpaired seta situated almost at the tip of the anal plate and about twice its length from the anus. Legs very stout; femur II and patella II subequal and both broader than long.

Length, 0.96 mm.; width, 0.45 mm.

Male.—Unknown.

Type host and type locality.—From a lemur, Mahanoro, Madagascar.

Type.—Cat. No. 901, U. S. N. M.

Described from a single female specimen, the holotype, taken from a dried lemur skin (U. S. N. M. 63337) collected about 50 miles northwest of Mahanoro, Madagascar. The presence of a brush of setae on each chelicera differentiates this species from all others mentioned in this paper.

Laelaps braziliensis, new species.

Female.—A small, stout species. Chelicerae very stout; movable chela about twice as big as fixed chela and strongly hooked at the end; fixed chela almost straight with small teeth at its tip. First pair of anterior apical setae slightly curved, strongly divergent and twice as long as second pair. Sternal plate broader than long, with anterior corners prolonged into long spine-like processes which extend between the first and second coxae. Sternal pores slit-like; first pair slightly posterior and lateral to the first pair of setae; second pair half way between second and third pairs of sternal setae. Genito-epigastric plate small, not as broad as the distance between posterior coxae. Anal plate very long, rounded in front and attenuated behind; anus very large, rim thicker in front than at the sides, and situated not over one-fourth its greatest diameter from the anterior margin of anal plate; paired anal setae situated slightly behind the middle of the anus and about half way from the anal rim to the margin of anal plate; unpaired anal seta stouter than the paired ones and situated at the apex of anal plate. Legs stout, all shorter than the body; femur I and patella I subequal.

Length, 0.49 mm.; width, 0.29 mm.

Male.—Not known.

Type host and type locality.—*Kerodon spiki* from Bahia, Lamas, Brazil.

Type.—Cat. No. 902, U. S. N. M.

Described from a female, holotype, taken from a skin of *Kerodon spiki* ♀ (U. S. N. M. 123391), collected May 15, 1903, by A. Robert at Bahia, Lamaras, Brazil. This species differs from all those known to the writer in having such a large anal opening and long anal plate.

***Laelaps wetmorei*, new species.**

Female.—Medium sized, stout and spiny. Chelicerae stout, chelae unequal. First pair of anterior apical setae close together, straight, parallel; second pair dorsal rather than marginal and strongly recurved; third pair closer together than the second pair, longer and more strongly recurved. Sternal plate about as broad as long, broadest between coxae II and III. Sternal pores slit-like; first pair directly behind the first sternal setae, transverse; second pair about midway between second and third pairs of sternal setae, oblique. Sternal setae almost subequal and arranged into two divergent lines. Genito-epigastric plate incompletely divided into genital and epigastric plates. Epigastric plate proper broader than the space between the posterior coxae and with eight, long, subequal marginal setae. Anal plate broader than long; anus situated about two-thirds its greatest diameter from the anterior margin of the anal plate; paired anal setae situated at about the level of the posterior margin of anus, smaller than the unpaired anal seta; unpaired anal seta almost as long as the anal plate itself and situated near the tip of anal plate. Legs stout, femora I and II and patella I and II spined. Coxa I with a large tooth-like spine at its base posteriorly; coxa II with a very sharp, stout, low tooth-like spine on its anterior side; coxa III with large tooth-like spine on its postero-inner aspect; coxa IV without any tooth-like spine.

Length, 0.79 mm.; width, 0.52 mm.

Male.—Not known.

Type host and type locality.—A rat (Muridae) from Carhué, Province of Buenos Aires, Argentina.

Type slide.—Cat. No. 903, U. S. N. M.

Described from the following: Six females (type slide) from a rat (Biol. Sur. 236319) collected by A. Wetmore at Carhué, Buenos Aires Province, Argentina, Dec. 16, 1920; other females as follows, from rats by the same collector; four (Biol. Sur. 236318) at Carhué, Province of Buenos Aires, Argentina, Dec. 16, 1920; three (Biol. Sur. 236320) at Carhué, Province of Buenos Aires, Argentina, and one (Biol. Sur. 236289) at Kilometro 182, Territory of Formosa, Argentina. The tooth on coxa I in this species is very characteristic. Its large size and its position at the base of the segment at the middle of the posterior border differentiates this species, I believe, from all others of the genus.

***Laelaps robustipes*, new species.**

Female.—A small stout species. Chelicerae moderate; movable chela curved and with three large teeth in addition to terminal hook of the element; fixed

chela smaller, straight and with a few minute teeth. Anterior apical setae all slightly curved spines; anterior pair subequal to second pair, divergent; second pair directed backwards; third pair much stouter and longer than second pair. Sternal pores, oblique slits and in the usual position; sternal setae large and subequal, anterior and posterior pairs marginal. Anal plate longer than broad; anus very large; paired anal setae slightly smaller than unpaired seta and situated in front of posterior margin of anus; unpaired anal seta situated its length from the anus and almost at the tip of anal plate. Apparently all coxae without tooth-like spines. Second pair of legs very stout; femur almost twice as broad as long; patella similar to femur but scarcely as wide; tibia as broad as long; tarsus almost twice as long as tibia and ending in a terminal hook.

Length, 0.58 mm.; width, 0.38 mm.

Male.—Not known.

Type host and type locality.—From a rodent at Guaminí, Province of Buenos Aires, Argentina.

Type slide.—Cat. No. 904, U. S. N. M.

Described from one female taken from a rodent at Guaminí, Province of Buenos Aires, Argentina. The second pair of legs in this species is stouter than in any of the other American species.

***Laelaps californicus*, new species.**

Female.—Chelicerae moderate, when extended reaching beyond the tips of palpi; both arms curved and of nearly the same length; seta leaf-like toward its base, as long as one of the arms of the chelicerae. Anterior pair of anterior apical setae, straight, divergent; second pair strongly recurved and incurved; third pair recurved but not incurved, longer than the second pair. Sternum about as broad as long; sternal setae long, slender, subequal and arranged into two divergent lines. Anal plate subtriangular, about as broad as long; anus situated about three-fourths its greatest diameter from the anterior margin of anal plate; paired anal setae situated at about the level of the middle of the anus; unpaired anal seta longer than paired anal setae and situated about one-half its length from the anus. Coxa II with a sharp, tooth-like spine on its anterior margin, all other coxae without a tooth-like spine. Legs rather slender for the genus; first pair much longer than the second pair; tarsus I but slightly longer than tibia II.

Length, 0.67 mm.; width, 0.46 mm.

Male.—Not known.

Type host and type locality.—Host (?); type locality, Topaz, Calif.

Type slide.—Cat. No. 905, U. S. N. M.

Described from ten females taken from a mouse nest (Bishop No. 7650) at Topaz, California, May 29, 1918. This species is related to *L. robustipes*, new species, but does not have the stout second pair of legs.

***Laelaps glasgowi*, new species.**

Female.—Medium sized with well developed shoulders. Chelicerae with subequal chelae and each hooked at the tip. Anterior pair of anterior apical setae about straight, divergent; second pair strongly recurved and incurved; third pair strongly recurved and longer than second. Sternal plate about as broad as long and produced into a long, sharp cusp on each side between the second and third pairs of coxae. Sternal pores straight, oblique slits. Sternal setae subequal and arranged into two oblique rows. Anal plate about as broad as long. Legs moderate; first pair extending beyond the tips of second by almost the full length of tibiae and tarsi; tarsus I of uniform width throughout and about one and a third times as long as tibia I; tibia I slightly longer and slightly narrower than patella I; patella I and femur I subequal. Posterior pair of legs extending beyond the tip of body by about one-half their length.

Length, 0.57 mm.; width, 0.40 mm.

Male.—Unknown.

Type host and type locality.—From a "wild rat" at Urbana, Illinois.

Type.—Cat. No. 906, U. S. N. M.

Described from a female collected from a "wild rat" at Urbana, Illinois, by H. Glasgow, Dec., 1912. Related to *L. californicus*, new species, but coxa II lacks the tooth-like spine.

***Laelaps virginianus*, new species.**

Female.—Chelicerae with chelae about equal, both hooked at the tips; movable chela with three teeth, fixed chela with two teeth; seta on chelicera inflated for its basilar half and curved at its tip. First pair of anterior apical setae straight, divergent; second pair recurved and incurved until their apices meet; third pair longer than second and strongly recurved. Sternal pores curved slits, second pair obliquely situated midway between second and third pairs of sternal setae; sternal setae long, slightly curved, subequal and arranged into two divergent rows. Genito-ventral plate with a single pair of setae, extending half way to the anal plate. Anal plate sub-triangular with broadly rounded sides; anus situated about three-fourths its greatest diameter from the front margin of anal plate; paired anal setae situated considerably in front of level of posterior margin of anus; unpaired anal seta longer than paired anal setae and situated at about two-thirds the distance from the anus to the tip of anal plate. First pair of legs much longer than second pair; tarsus I slightly longer than tibia I.

Length, 0.73 mm.; width, 0.42 mm.

Male.—Unknown.

Type host and type locality.—From a "wild mouse" at East Falls Church, Virginia.

Type.—Cat. No. 907, U. S. N. M.

Described from a female specimen taken from a mouse trapped at East Falls Church, Virginia, Sept. 19, 1919, by the writer. This species is related to *L. glasgowi*, new species, but has not the shoulders.

***Laelaps reithrodontis*, new species.**

Female.—Chelicerae moderate; movable chela larger than fixed chela and each provided with two teeth. Sternal plate broader than long and projecting between second and third coxae in the form of long, chitinous cusps. Sternal pores, oblique, curved slits, in their usual position. Sternal setae subequal, in two oblique rows; first pair situated directly on the anterior margin of sternal plate. Genito-epigastric plate extending over half way to anal plate and about as broad as the latter. Anal plate as broad as long; anus situated about two-thirds its greatest diameter from the anterior margin of anal plate; paired anal setae situated about opposite to the middle of the anus; unpaired anal setae situated slightly nearer the apex of anal plate than the posterior margin of anus. None of the coxae with a tooth-like spine. Tarsus I about one and a third times as long as tibia I and with a pseudosegment at the base that is twice as broad as long. Tibia II but slightly longer than patella II.

Length, 0.77 mm.; width, 0.44 mm.

Male.—Not known.

Type host and type locality.—From *Reithrodon cuniculoides* at Huanuluan, Territory of Río Negro, Argentina.

Type.—Cat. No. 908, U. S. N. M.

Described from a single female (holotype) taken from a female skin of *Reithrodon cuniculoides* (U. S. N. M. 238125) collected at Huanuluan, Territory of Río Negro, Argentina.

**ON THE TYPES OF "PYRAUSTA" CAFFREII FLINT & MALLOCH
(LEPIDOPTERA: PYRALIDAE: PYRAUSTINAE).**

By WM. BARNES AND F. H. BENJAMIN, *Decatur, Illinois*.

Loxostege ("Pyrausta") *caffreii* Flint & Malloch, Bull. Ill. N. H. Surv., XIII, 1920, p. 304, ff. 43-44, (*Pyrausta*).

The type male and allotype female which served for the original description of *caffreii* are before the authors through the kindness of Dr. Frison of the Illinois Natural History Survey. Heinrich (Ent. News, XXXII, 1921, p. 57) is correct in the statement that *caffreii* belongs in *Loxostege* and that the male type is *similalis* Gn. It probably represents the same form as *rantalalis* Gn. but the specimen is too rubbed to be sure, and the name *rantalalis* has little significance.

The female represents the species going under the name of *obliteralis* Wlk. (*marculenta* G. & R.). The authors are not certain of the identity of the Walker name with that species placed under it (*marculenta*) in all North American collections.

FOUR NEW THYSANOPTERA FROM AFRICA.

By J. DOUGLAS HOOD, *University of Rochester.*

The new species described below were collected by Mr. Arthur W. Jobbins-Pomeroy, Government Entomologist of Southern Nigeria, in 1915, and the descriptions have been prepared and awaiting publication for six or seven years.

All types are in the writer's collection.

Anaphothrips flavidus, new species.

Female (macropterous).—Length about 1.1 mm. Color bright yellow, the seven basal abdominal tergites each with a brown blotch occupying the median half; last two abdominal segments more heavily chitinized, darker laterally, and with orange colored pigment; wings smoky gray, darker along the longitudinal veins; legs concolorous with body; antennæ dark brown, with segment 1 nearly colorless, and segments 3 and 4 yellow, lightly clouded with brown toward apex; ocellar pigment bright red.

Head very slightly longer than wide and slightly longer than prothorax; occiput with a few faint anastomosing lines; bristles minute, colorless. Eyes 0.4 as long as head, 0.8 as long as cheeks, and 0.6 as wide as their interval. Ocelli rather widely separated, forming a nearly equilateral triangle, the center of which is opposite middle of eyes. Antennæ about 1.64 times as long as head, structure normal to the genus; sense cones on third and fourth segments forked, short; sixth segment not divided. Maxillary palpi three-segmented.

Prothorax about 1.3 times as wide as long and slightly shorter than head; pronotum smooth, with a few very minute, transparent bristles on disk, and without bristles at either the anterior or posterior angles. Wings of fore pair with two longitudinal veins extending from base to tip, each vein with a few scattered bristles. Legs rather short and stout.

Abdomen with posterior margin of segment 8 produced dorsally into a comb of slender spines; segments 9 and 10 more heavily chitinized, the latter divided above; bristles as in *A. obscurus*.¹

Measurements of holotype (♀): Length 1.260 mm.; head, length 0.146 mm., width 0.144 mm.; prothorax, length 0.144 mm., width 0.186 mm.; pterothorax, width 0.240 mm.; fore wings, length 0.660 mm., width near base 0.063 mm., at middle 0.044 mm.; abdomen, width 0.240 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	22	33	40	36	35	46	10	13
Width (μ)	26	27	19	18	19	18	8	5

Total length of antenna 0.235 mm.

Male (macropterous).—Length about 0.09 mm. Very similar to female, but smaller, slenderer, and paler. First antennal segment nearly colorless; 2-4 and base of 5, yellow, 2 darker at sides and 4 darker at apex; remainder of antenna dark brown. Abdomen with apical segments more heavily chitinized, and with the last two segments suffused with orange-colored pigment; segment 9 with two pairs of chitinous dorsal projections, those of the posterior pair slightly more widely separated.

¹See Hinds, Proc. U. S. Nat. Mus., Vol. XXVI, 1902, Pl. V, fig. 50.

Measurements of allotype (σ^7): Length 1.056 mm.; head, length 0.123 mm., width 0.126 mm.; prothorax, length 0.117 mm., width 0.141 mm.; pterothorax, width 0.201 mm.; fore wings, length 0.540 mm., width near base 0.063 mm., at middle 0.041 mm.; abdomen, width 0.201 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	21	30	36	32	32	40	08	12
Width (μ)	24	22	17	16	17	16	7	5

Total length of antenna 0.211 mm.

Described from one individual of each sex, taken by Lieut. A. W. Jobbins-Pomeroy from *Andropogon tectorum*, at Ibadan, Southern Nigeria, January 11, 1915.

This species is a true *Anaphothrips*, closely resembling *A. obscurus* but more slender and graceful in outline. From the three described African species of this genus—*loennbergi* Trybom, *sudanensis* Trybom, and *alternans* (Bagnall), the latter of which is represented in the material before me by a female cotype in excellent condition, received from Mr. Bagnall—it may at once be known by the yellow color, the uniform gray wings, the long head, and by having the eyes shorter than the cheeks.

Astrothrips pentatoma, new species.

Female (macropterous).—Length about 1.14 mm. Dorsal surface deeply reticulate. Color yellowish brown, with sides of pterothorax and abdominal segments 2–7 dark brown; abdomen paler towards apex, especially medially, and with sides of segments 8 and 9 and apical third of 10, darkened with blackish; antennæ yellow, with segments 1 and 2 darker and segment 5 brownish in apical third; femora brown, somewhat paler apically; tibiae with slender basal portion and apical half or third, yellow, intermediate portion brown, middle tibiae darkest; tarsi pale yellow; fore wings with a brown band at basal third and one at apical fifth, each interrupted at middle of wing; basal sixth of fore wings yellowish brown, intervening portions darkened along anterior and posterior margins with brown; hind wings light gray-brown, darker toward apex, and with a dark brown median streak from near base.

Head polygonally reticulate, about 1.6 times as wide as long, very slightly broadest across eyes; cheeks nearly straight, slightly converging posteriorly, and abruptly constricted at extreme base to form a neck 0.7 as broad as the distance across eyes; vertex elevated and produced, overhanging insertion of antennæ, and bearing the ocelli, of which the anterior surpasses the front margin of eyes and is directed forward, and the posterior pair laterally. Eyes half as long as head, longer than their distance from the neck, and about one-third as wide as their interval. Antennæ five-segmented, two and one-third times as long as head, and reticulate; segment 1 short, subcylindrical, slightly broader than long; 2 broadest in entire antenna, goblet-shaped, pedicellate; 3 slender, vasiform pedicellate, four times as long as wide; 4 about 0.67 as long as 3 and somewhat stouter; 5 longest in entire antenna and somewhat broader than 4, fusiform and pedicellate; sense cones short and simple.

Prothorax about 1.7 times as wide as long, equal in length to head and similarly reticulate, somewhat broadest anteriorly, sides broadly rounded; pronotum with a broad transverse furrow in front of middle and a pair of large transversely elliptical foveæ behind middle; lateral margin explanate. Pterothorax 0.8 as long as wide and about one and one-third times as wide as prothorax, strongly narrowed behind, sides rounded; mesoscutum polygonally reticulate at sides and behind, remainder with anastomosing striæ converging to posterior portion of median line. Wings of fore pair about sixteen times as long as width at middle, which is slightly more than half the greatest subbasal width; ring vein reinforced along anterior and posterior margin by the complete fusion with them of the two principal veins; bristles on fore wings stout, heavy, broader at middle than at base, and more or less blunt, nearly as long as width of wing at middle, those on the dark transverse bands nearly black, costal margin with about 13, anterior vein with 7 beyond fork, and posterior vein with 10; anterior margin of fore wings near base with a ventral brush of about nine hairs. Legs slender, reticulate, hind pair longest.

Abdomen wider than pterothorax, strongly and sharply constricted beyond base of segment 2, which is the longest in entire abdomen; 10 tubular, three-fifths as wide at base as long, not constricted near base, divided in entire length above by a longitudinal suture; sides of basal tergites deeply reticulate, except 1, which is smooth, and 2, which is asperate; dorsum of 9 and 10 lightly polygonally reticulate; bristles minute, those on segment 9 and the stouter pair at apex of 10 less than one-third as long as the latter segment.

Measurements of holotype (♀): Length 1.140 mm.; head, length 0.110 mm., greatest width 0.180 mm., basal width 0.124 mm.; eyes, length 0.056 mm., width 0.036 mm., interval 0.102 mm.; prothorax, length 0.113 mm., width 0.194 mm.; pterothorax, width 0.264 mm.; abdomen, greatest width 0.317 mm.; segment 10, length 0.098 mm., width at base 0.060 mm.; fore wings, length 0.648 mm., width at middle 0.041 mm., near base 0.073 mm.

Antennal segments:	1	2	3	4	5
Length (μ)	24	39	68	46	84
Width (μ)	26	33	17	18	19

Total length of antenna 0.261 mm.

Described from one female taken by Lieut. Arthur W. Jobbins-Pomeroy at Ibadan, Southern Nigeria, in a flower of *Phaseolus lunatus* L., January 27, 1915.

Readily known by the five-segmented antennæ.

Liothrips genualis, new species.

Female (macropterous).—Length about 1.7 mm. Color blackish brown; antennal segments 2–5 brown, successively darker, each more or less clouded; 6–8 dark blackish brown; tips of femora, both ends of fore tibiæ, and all tarsi, yellow; fore wings light brown, with a pale longitudinal streak in posterior third; hind wings slightly paler than fore wings and with a dark median streak in basal two-thirds.

Head about 1.14 times as long as wide, cheeks straight and parallel; vertex slightly produced, the anterior ocellus directed forward and upward, very

slightly overhanging; dorsal and lateral surfaces distinctly transversely striate with anastomosing lines and with a few minute bristles; postocular bristles capitate and about equal in length to eyes. Eyes about 0.36 times as long as head and not protruding. Posterior ocelli slightly in front of a line drawn through middle of eyes. Antennae twice as long as head, of the general form and structure common to the species of the genus, segments 7 and 8 rather closely united; sense cones disposed as follows: 3, 0-1; 4, 1-2; 5, 1-1 +1; 6, 1-1 +1; 7 with one on dorsum near apex. Mouth cone long, acute, attaining base of prosternum.

Prothorax along median dorsal line about 0.7 times as long as head and (inclusive of coxæ) about 2.5 times as wide as long; all bristles present, long, capitate, the two pairs at the posterior angles longest and subequal; coxal bristle about equal in length to anterior angular. Pterothorax slightly wider than prothorax, sides slightly arcuate. Wings long, less closely fringed than usual, of nearly the same width throughout; fore pair with the three subbasal bristles capitate and about equal in length to the two pairs on anterior margin of prothorax, and with eight or nine accessory hairs on posterior margin. Fore tarsi unarmed.

Abdomen of normal form, large and heavy, wider than pterothorax. Tube about 0.8 as long as head and very slightly more than twice as wide at base as at apex, sides straight. Lateral abdominal bristles capitate in part, those on apical segments about 0.8 as long as tube, all bristles on segment 9 pointed; terminal bristles equal in length to tube, brown.

Measurements of holotype (♀): Length 1.66 mm.; head, length 0.228 mm., greatest width 0.199 mm.; eyes, length 0.082 mm., width 0.060 mm., interval 0.067 mm.; postocular bristles, length 0.079 mm.; prothorax, length 0.156 mm., width (inclusive of coxæ) 0.396 mm.; pterothorax, length 0.396 mm., width 0.406 mm.; abdomen, greatest width 0.444 mm.; tube, length 0.186 mm., width at base 0.096 mm., at apex 0.046 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	45	60	66	65	67	60	54	37
Width (μ)	44	37	34	36	34	33	27	15

Total length of antenna 0.454 mm.

Described from one female taken by Lieut. A. W. Jobbins-Pomeroy on *Bougainvillea glabra* at Ibadan, Southern Nigeria, January 11, 1915.

The North American *L. leucogonis* is the only other species of the genus in which the knees are described as pale. The dark wings of the present species are also an unusual character.

Liothrips badius, new species.

Female (macropterous).—Length about 2 mm. Color chestnut brown, with head, apical abdominal segments, and basal half of tube darker; segment 3 of antennæ distinctly paler in basal two-fifths, segments 4-6 slightly paler basally; legs concolorous with body, except tarsi, which are yellowish; wings brown, the fore pair with a darker median streak extending from the region of the three subbasal bristles to tip of wing, this streak margined posteriorly with a narrower

colorless one, the latter about equal in width to a second brown streak forming the posterior margin of wing; hind wing with a narrower dark streak extending from base to apex, broadly margined anteriorly with paler.

Head about 1.37 times as long as wide, cheeks straight and parallel; vertex slightly produced, the anterior ocellus directed forward and distinctly overhanging; dorsal and lateral surfaces finely but distinctly transversely striate with anastomosing lines and with a few very minute and indistinct bristles; postocular bristles unusually short and inconspicuous, less than one-third as long as eyes, pointed. Eyes about 0.38 as long as head, not protruding. Posterior ocelli distinctly in front of a line drawn through middle of eyes. Antennæ twice as long as head, unusually slender, segments 7 and 8 rather closely united; sense cones long and slender, disposed as follows: 3, 0-1; 4, 1+1-2; 5, 1-1+1; 6, 1-1+1; 7 with one on dorsum near apex. Mouth cone attaining base of prosternum, the labrum surpassing the broadly rounded labium.

Prothorax along median dorsal line about 0.52 as long as head and (inclusive of coxæ) about 2.5 times as wide as long; all bristles present, blunt or slightly capitate, dark brown in color, the two pairs on anterior margin about equal in length to postoculars, the others more than twice as long and subequal in length; coxal bristle somewhat shorter and more slender than midlateral. Pterothorax distinctly wider than prothorax, sides slightly arcuate. Wings long, of nearly the same width throughout; fore pair with the three subbasal bristles slightly capitate and subequal to midlateral, and with nine or ten accessory hairs on posterior margin. Legs long and slender; fore femora not at all swollen; fore tarsi unarmed.

Abdomen of normal form, large and heavy, wider than pterothorax. Tube 0.83 as long as head and twice as wide at base as at apex, sides straight. Lateral abdominal bristles stout, dark brown, and conspicuous, similar to the larger ones on prothorax, with the exception of those on segment 9 which are slender, pale, and pointed, and those at apex of tube, which are slender, brown, pointed, and about 0.8 as long as tube.

Measurements of holotype (♀): Length 2.04 mm.; head, length 0.288 mm., greatest width 0.210 mm.; eyes, length 0.111 mm., width 0.072 mm., interval 0.069 mm.; postocular bristles, length 0.031 mm.; prothorax, length 0.151 mm., width (inclusive of coxæ) 0.373 mm.; pterothorax, width 0.456 mm.; fore wing, length 1.14 mm., width at middle 0.108 mm.; abdomen, greatest width 0.550 mm.; tube, length 0.240 mm., width at base 0.093 mm., at apex 0.046 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	51	65	87	87	91	86	71	45
Width (μ)	42	34	29	32	29	29	24	14
Total length of antenna 0.583 mm.								

Described from one female taken by Lieut. A. W. Jobbins-Pomeroy in Kamerun, December 12, 1915, by sweeping.

The long head and general facies are suggestive of such species as the North American *Liothrips citricornis*. It may readily be known, however, by the coloration of the wings and antennæ, the unarmed fore tarsi, and the minute postocular bristles.

A NEW TACHINID PARASITE OF A COCOANUT MOTH IN SOUTH ASIA (DIPTERA).

BY J. M. ALDRICH.

The parasite described below appears to have considerable economic importance as it has been reared in large numbers from a very injurious moth.

***Ptychomyia remota*, new species.**

Resembles *Ptychomyia selecta* Meigen, type of the genus, in size and the following characters (I have only the female of *selecta*, one European specimen determined by Brauer and Bergenstamm, for comparison): eyes and parafacials bare; ocellar bristles proclinate, far apart, located a trifle below the level of the anterior ocellus; third antennal joint long, nearly five times the second in the female, penultimate joint of arista about three times as long as thick; facial ridges with strong erect bristles almost up to arista; facial depression deep; bucca (below eye) narrow. Third vein with strong setules at base, usually extending nearly to the crossvein. Four dorsocentrals, three sternopleurals; mid tibia with two bristles on outer front side, the upper one smaller; hind tibia with irregular row on outer extensor side; female with last abdominal segment in the form of a short, blunt cone.

Differs from *selecta* in having yellow palpi, a pair of small apical scutellars directed backward besides the three lateral ones; no discal abdominal macrochaetae.

Color black, except palpi. Front in both sexes .31 of the head-width (two males and two females all measured the same by micrometer); parafrontals, mesonotum and basal half of abdominal segments 2-4 with golden-yellow pollen; parafacials silvery, at narrowest less than half as wide as third antennal joint; bucca hardly one-tenth of eye height; frontal bristles rather far apart, only about seven in number, the lowest almost meeting the row on facial ridge. Apical half or more of abdominal segments 2-4 shining black, the basal pollinose bands interrupted in middle.

Length 4.5 to 5 mm.

Described from 19 males and 13 females, bred from larvae of *Artona catoxantha* Hampson, a zygaenid moth seriously attacking cocoanuts, in the Federated Malay States. Received from B. A. R. Gater, office of Secretary for Agriculture, Federated Malay States and Straits Settlements. Eight paratypes are returned to Mr. Gater and others are deposited in the British Museum and the collection of Professor M. Bezzi, Turin, Italy.

Type.—Male, Cat. No. 27,739, U. S. N. M.

DESCRIPTION OF WINGED ADULT OF *KALOTERMES APPROXIMATUS* SNYDER (ISOPTERA).

By THOS. E. SNYDER, *U. S. Bureau of Entomology.*

Winged adult.—On August 23, 1924, the writer found at Cape Henry, Va., winged adults of *Kalotermea approximatus* Snyder in the same tree that the soldier was found on December 15, 1923, and in the same locality where the dealated adult was collected on April 7, 1923. Most of these winged forms had attained mature color and were with soldiers and nymphs in the inner heartwood near the center of the tree or core. The dark color and black wings distinguish these winged forms from all other species of *Kalotermea* except *K. minor* Hagen from the Pacific Coast. The winged adult of *K. approximatus* is smaller than *minor*. The following is a detailed description of the winged adult as well as additional notes on the soldier caste.

Antennae 16 segments.

Wings blackish, membrane smoky, punctate; costal veins blackish; in forewing subcostal vein with 10–11 branches to costal vein, the first 7 being fairly long; median vein runs about half way between subcosta and cubitus, branches beyond over half length of wing, reaches apex; cubitus does not reach apex, with 13 branches or sub-branches to lower margin of wing, occupies less than one-half wing area (in width). In hind wing, subcostal vein with 5 branches to costal vein, mostly very long; median vein slightly nearer to cubitus than to subcosta, branches at about basal one-third of wing, reaches apex; cubitus with about 10 branches or sub-branches to lower margin of wing.

Measurements:

Length of entire winged adult: 9.50 mm.

Length of entire dealated adult: 7.50 mm.

Length of fore wing: 6.75 mm.

Width of fore wing: 2.10 mm.

Soldier.—Antennae with 13–15 segments. Right mandible with marginal denticles from marginal teeth to tip.

CHANGE OF A PREOCCUPIED NAME (LEPIDOPTERA: AEGERIIDAE).

By WM. BARNES AND F. H. BENJAMIN, *Decatur, Illinois,*

Melittia lindseyi, new name.

Melittia superba Barnes & Lindsey, Bull. Brooklyn Ent. Soc., Vol. 17, 1922, p. 122.

Mr. August Busck has informed the senior author that the name *superba* is preoccupied in *Melittia* by *superba* Rothschild, 1909, Novitates Zoologica, XVI, 132.

TWO NEW MEXICAN CERAMBYCIDAE (COLEOPTERA).

BY W. S. FISHER, *U. S. Bureau of Entomology.***Eupogonius knabi**, new species.

Male.—Elongate, subcylindrical, uniformly reddish-brown above, densely clothed with short recumbent yellowish-white pubescence (slightly denser on sides of pronotum than at middle), nearly concealing the punctures, and with numerous rather short erect hairs arising from the punctures; beneath similar to above, but the surface has a mottled appearance, and the erect hairs are slightly longer.

Head strongly transverse and feebly convex in front, feebly concave between the antennal tubercles, which are slightly elevated, and the surface rather densely, coarsely and irregularly punctate; eyes coarsely granulated, very deeply emarginate, and separated from each other on the top by about the width of the emargination of the eyes in front. Antennae a little longer than the body, robust, reddish-brown, and densely clothed with short recumbent cinereous hairs, except the apical half of the tenth, and basal two-thirds of the eleventh joint, which are clothed with brown pubescence; in addition the first four joints are densely clothed on all sides with rather long erect hairs, while the following joints are only sparsely clothed with similar hairs on the under side; first joint short, subcylindrical, slightly more robust than the second, and three-fourths as long as the third joint, which is subequal in length to the fourth, the following joints considerably shorter, and subequal in length, except the last two, which are shorter. Pronotum as wide as long, base and apex about equal in width; sides nearly parallel, with a very short obtuse tooth on each side at the middle; surface regularly convex, slightly uneven, and sparsely, coarsely and irregularly punctate. Elytra three and one-fifth times as long as pronotum and considerably wider than it at base; humeral angles broadly rounded; sides feebly obliquely attenuate to apical fourth, then arcuately attenuate to the tips, which are separately, rather narrowly rounded; surface irregularly punctate, the punctures coarse and rather closely placed in the basal region, but becoming much finer and widely separated toward the apex. Abdomen beneath sparsely, coarsely, but obsoletely punctate, and finely granulose; last segment broadly arcuately, but not deeply emarginate at apex. Femora strongly swollen toward apex. Tibiae rather robust, more or less flattened, and enlarged at apex, the median ones distinctly grooved. Tarsi broadly expanded.

Length 9 mm.; width 3.2 mm.

Type-locality.—Vera Cruz, Mexico.

Type.—Cat. No. 27893, U. S. N. M.

Described from one male collected at the type-locality, December 16, 1907, by Frederick Knab.

This species is related to *comus* and *ursulus* described by Bates, which have the first four joints of the antennae densely clothed with long hairs on all sides, while the following joints are only ciliated on the under side. From the former it differs by not having the black markings on the elytra, and the pubescence on the antennae of a uniform color, and from *ursulus*

it can be separated by the pubescence on antennae of a uniform color, and the fifth to eleventh joints not dilated on the one side.

***Eupogonius marmoratus*, new species.**

Female.—Elongate, uniformly piceous above, sparsely clothed with very short recumbent yellowish-white pubescence, and small, widely separated patches of denser and longer cinereous hairs, and with numerous long erect setae arising from the punctures; beneath reddish-brown, the legs more or less rufous, and the surface sparsely clothed with short recumbent and long flying cinereous hairs intermixed.

Head strongly transverse and feebly convex in front, flat between the antennal tubercles, which are scarcely elevated, and the surface sparsely, coarsely and irregularly punctate; eyes coarsely granulated, deeply emarginate, and separated from each other on the top by twice the width of the emargination of the eyes in front. Antennae about as long as the body (right antennae missing), uniformly dark brown, sparsely clothed with short recumbent brown pubescence, except the last seven joints, which are narrowly annulated with whitish pubescence at base; in addition the joints are densely clothed with moderately long erect hairs; first joint short, robust, subclavate, and about three-fourths as long as the third joint, which is subequal to the fourth, the following joints much smaller, and nearly equal in length. Pronotum as wide as long, apex and base about equal in width; sides nearly parallel, with a short, acute tooth on each side at the middle; surface regularly convex, somewhat uneven, obsoletely transversely depressed near base, and rather sparsely, very coarsely and irregularly punctate. Elytra three and three-fourths times as long as pronotum and considerably wider than it at base; humeral angles broadly rounded; sides feebly obliquely expanded to apical third, then arcuately attenuate to the tips, which are separately, rather narrowly rounded; surface rather densely and irregularly punctate, the punctures coarser in the basal region, but becoming finer toward the apex. Abdomen beneath obsoletely punctate and granulose; last segment broadly rounded at apex. Femora strongly swollen at middle. Tibia slender, cylindrical, not enlarged at apex, and the middle ones not distinctly grooved. Tarsi narrow.

Length, 5 mm.; width, 1.5 mm.

Type locality.—Cordoba, State of Vera Cruz, Mexico.

Type.—Cat. No. 27894, U. S. N. M.

Described from one female collected at the type-locality, February 5, 1908, by Frederick Knab.

This species is allied to *subnudus* described by Bates from Guatemala, but differs from that species in having the head and pronotum sparsely clothed with yellowish-white pubescence, and the last seven joints of the antennae narrowly annulated with cinereous pubescence at base.

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ADDRESS OF THE RETIRING PRESIDENT.

BY ADAM G. BÖVING.

A SUMMER TRIP IN ICELAND SOUTH OF VATNA-JÖKUL.¹

The southeastern part of Iceland is covered by an immense ice plateau, "the Vatna-jökul." A mighty mountain range of gray and black basalt follows the coast line. Its upper ridges and peaks are capped with snow and near the top there are cracks and deepenings in the sides of the mountains filled with snowdrifts. Farther down are many brooks and waterfalls, looking from the distance like shining silver bands. On the terraces and hills at the foot of the mountains where the ground is moist and contains sufficient humus are a number of fresh, green grass-fields. Here the farmhouses of the Icelandic settlers are built. Through passages in the mountain range the glaciers from the interior ice plateau descend to near the Atlantic ocean, plowing up the underground and forming a typical moraine landscape. In the intervening area between the ocean and the foot of the glaciers, or the foot of the mountains, are extensive flat and low plains of sedimentary sand and gravel, deposited in enormous quantities by the rivers coming out from under the bottoms of the glaciers.

All these conditions as they exist here to-day, are very similar to those that prevailed in the regions south of the mountains of Norway and Sweden during the prehistoric glacial periods and from which not only Denmark but most of the low-lands of middle Europe originated.

Unquestionably, for the discussion of many of the problems pertaining to this remote period it would be most profitable to study the correspondent recent phenomena in Iceland. No investigation, however, had ever been undertaken here by any geologist, of Danish or other nationality, familiar with the glacial questions of Europe, except by the famous Icelandic geologist Thoroddsen, who had travelled frequently in these localities and written about them. Therefore when the Danish

¹The material collected on this trip has not been worked up scientifically and no technical account has been published on the results. All the botanical and zoological names given in the present paper are from my diary and are to be considered merely as preliminary field determinations.

geologist, Dr. Poul Harder, in the beginning of the year 1908 suggested a geological and biological expedition to be sent to Iceland, southeast and south of Vatna-jökul the University of Copenhagen favored the project and it was decided that Dr. Harder himself should be the leader of the undertaking. At that time I was studying in England but Dr. Harder wanted me along with him to collect plants and insects, and it was therefore arranged that I should join the expedition at Leith, Scotland.

We had to bring everything with us from Copenhagen: two tents with tent-poles, a theodolite, a large camera and other instruments, nets, vials, labels, alcohol, pins and miscellaneous implements, bags of rice and oat flakes, tinned meat, soup, fruit and butter, clothing, wooden shoes, etc., all carefully packed in solid, waterproof wooden boxes. Each box, with the full contents, weighed one hundred pounds and was ready to be hooked onto the saddles of the pack-horses, one box on each side of the horse, carefully adjusted to balance well. Only the horses had to be bought in Iceland and this had been arranged for by the merchant in Hornefjord.

The 13th of June we sighted land. The air was bitterly cold but very clear. The sea was dark blue. A single whale was swimming near the coast and a pair of eider-ducks were headed for the mainland flying close over the top of the waves. The lower parts of the coast mountains were seen through a thin haze, but above, the grey and black basalt was fully illuminated by strong sunlight and the snow on the top was gleaming. We went ashore at the small hamlet of Berufjord. Here we found our baggage in good order and the horses waiting for us, eleven pack and three riding horses, one of the latter for Dr. Harder, one for myself and one for an Icelandic student, Gislarsen, who was employed as our helper and interpreter.

The language spoken on Iceland nowadays has changed very little from the old Norse in which the Sagas were written, while the other Scandinavian languages, Danish, Norwegian and Swedish, which all have developed from this same original tongue, now differ so much from it that it is absolutely necessary to use an interpreter in dealing with Icelanders who only speak their mother tongue.

To travel in this part of Iceland is difficult and inconvenient as there are no roads, no bridges and the only possible way of communication is by horse-back riding. One is exposed to all kinds of hardships especially during the crossing of the streams and rivers as these continually change their courses and their depth varies all the time. Usually the horses can pass by wading but often they will have to swim. It is also risky to undertake the journey through these bare and dismal regions without a very definite knowledge about the distribution and size of the grass fields on which one must depend for food for the horses.

In this latter respect, however, we were very fortunate, having at our disposal detailed maps of the whole territory, which showed not only an elaborate system of altitude-curves, the size and location of the glaciers and the rivers, but also the lay of the farmhouses and the pastures. The maps were published by the Danish War Department after a most strenuous and difficult surveying under the leadership of the intrepid arctic explorer Capt. Kock. They had just been finished the year before our expedition started.

From Berufjord we started immediately for Hornefjord which was chosen as the first and most eastern station of our working field. It is south of Berufjord and to reach it we had to pass over mountains of the coast range rising to an altitude of about 1200 feet. The trip took us three days. The local guide, Gunnar from Tingnäs, was at the head of the expedition. He conducted the first packhorse, which was followed by the rest in a long row. Each horse was tied to the tail of the one in front of it by a rope from its head-gear. Harder and I brought up the rear.

"LOENS-HEDE"

One of the Mountains of the Coast Range.

This is a terribly desolate locality. The vegetation is extremely poor and low; a little bit of moss here, a thin tuft of grass there, but mostly bare, black basaltic rock wherever you look. Only in a few protected spots grew small blocks of the beautiful white *Dryas octopetala* ("the mountain anemone"), of *Silene acaulis*, *Saxifraga oppositifolia* and a small reddish-blue cruciferous plant. There were no hares or other mammals, no ptarmigans, or ravens or birds of prey, and apparently no insects of any kind. The metallic clattering of the horse-shoes against the rocks, the rattling of the boxes and the constant sharp shouting of the guide to the animals broke in a weird and ghostly way the monotony of the perpetual oozing and dripping of the water in the chilly and dead nature.

At last we reached the crest of the mountains and came close to the fields of the perpetual snow. They were not gleamingly white as they had appeared from a distance but the surface was dirty and dingy from blackish basaltic dust. In one place the ponies sank down belly-deep and there was water beneath the snow.

On our way down the cold air rather suddenly became very damp. We were in the midst of one of the thick, solid looking, whitish clouds which we had seen hanging around the peaks or slowly rolling down the mountain sides, covering and concealing everything. The descent, however, was free from danger and very easy. An immense conical talus of loose débris from the solid rock spread itself out, clothing the sides of the mountain

like a gigantic train. A narrow slanting riding-path ran obliquely from the top of the talus all the way down to the valley where the farmhouses and pastures were. It was eleven o'clock in the evening when we arrived here, but it was as light as it had been at noontime. The thermometer showed 7° centigrade.

"SVINAFELD"

One of the Mountain Valleys at the Foot of the Coast Range.

Svinafeld is a broad valley, with an elevation of about 50 meters above the sea-level, well sheltered toward the northeast and the southeast by moss-clad mountain sides. It was the most charming spot I saw on Iceland. The sky was very clear and the temperature at noon about 20° C. It was Sunday when we arrived. I am sure that this is correct; though to keep track of day and date was one of the things that sometimes caused us trouble, far away from civilization as we were, without regular mail and most of the time all by ourselves. The valley was carpeted with green grass and dotted with *Galium*, *Pedicularis flammea*, *Cerastium*, *Saxifraga oppositifolia*, a conspicuous purple *Geranium*, *Erigeron*, *Rumex*, *Thymus*, *Polygonum viviparum*, *Campanula uniflora* with one or two flowers, a light violet Gentian and the yellow arctic *Papaver nudicaule*. Here and there were blackberry-bushes in flower. In several places the pasture was overgrown with a foot high scrub of birch (*Betula odorata pubescens*). Between the birches grew the wooly willow (*Salix lanata*) and also *Salix glauca*, both of about the same height as the birches. Below the brush the *Poa* and *Agrostis* grasses were long, fine and fresh. In the background a sizeable brook wound its way down from the moss-clad rock, but gradually disappeared in a beautiful meadow where grew a multitude of various plants: in the wetter parts, *Carex*, *Juncus*, *Eriophorum*, *Luzula arcuata*, *Equisetum*, *Hypnum* and *Menyanthis*; on less swampy ground, a little greenish-white Orchid, the insectivorous *Pinguicula vulgaris*, the glorious green and white *Parnassia palustris*, *Calliha palustris* with large, shiny, yellow blossoms, *Dryas octopetala*, *Silene acaulis*, *Potentilla rupestris* and *Arctostaphylos* in flower but with dried berries from last year still hanging on it.

There are no butterflies on Iceland, only dark colored moths such as *Hadena maillardi* and different species of *Agrotis*. These were flying around lively in the blazing sunlight and were so occupied sucking honey from the different flowers, favorite among which is *Thymus*, that it was very easy to catch them even with the fingers. An inconspicuous Geometrid, probably *Larentia thulearia*, flew in great numbers around the birches. It is lively and elusive. The leaves of the birches were greatly damaged by a grey-blue Tortricid larva which spins three or four of the leaves together, skeletonizing them from the inside and eating the top shoot. Is it to protect themselves against

rain that they do so, or against the numerous parasitic wasps which are seen everywhere? The large black and yellow banded Dipteron, *Sericomyia lappona*, quick as lightning, buzzed around and several pretty, metallic species of *Syrphus* hung hovering in the air, now in sight and now away. Often they were seen resting on the sticky leaves of the birches and licking the sweet exudations. The wooly willow (*Salix lanata*) was damaged by a large black Geometrid-larva with two white stripes on the back and also by *Notaris acridulus*?, a small Curculionid with a pointed snout. On the leaves were the fresh marks of gnawing and the fine excrement of this weevil. The female eats a hole in the tip of one of the end-buds depositing an egg here, and afterwards the larva tunnels through the soft shoot in its entire length but stops as soon as it comes to the hard wood from the year before. The leaves on the sides of the young shoot wither and shrivel to a bulb-like body, which in a short while drops to the ground. One would expect the larvae to pupate inside of the bulb but I never found any pupae there. On the contrary I found several of the larvae about two inches down in the ground. These were placed in a jar with the soil in which they were found and four of them developed into imagines.

Black larvae of *Gonioctena viminalis*, newly hatched and about 7 mm. long, were feeding on the leaves of the same species of *Salix*, skeletonizing them in spots and leaving the epidermis intact on one of the sides. There were also the long white eggs of this Chrysomelid on the leaves but only a single imago was taken in the open; many, however, were found under stones. Altogether the results from turning stones were very satisfactory. Several Carabids were hidden below them, such as *Platysma frigidus*, *Calathus melanocephalus* with its characteristic rust-colored thorax, *Harpalus fulvipes*, and *Nebria gyllenhali*. There were a few small Carabid-larvae belonging to the genus *Bembidium* but I did not find the larvae of any of the larger Carabidae. The females, however, were full of eggs and several couples were taken in copula. Under the stones were found several small Staphylinids (among them *Omalium rivulare*, some *Atheta* species and *Tachinus collaris*), all stages of the click beetle *Cryptohypnus riparius* (the imagines covered with little red larvae of the arctic mite *Erythraeus phalangioides*), the imagines of the bean-like *Byrrhus fasciatus* and *Byrrhus pilula*, *Cytillus varius* related to *Byrrhus*, the dark weevil, *Otiorrhynchus arcticus*, and at least two other species of this genus. Almost everywhere on our trip, and in some localities of widely different character, I found the two species of *Byrrhus* and *Otiorrhynchus arcticus*. The larvae of the latter species were taken on the roots of different sort of grasses and once I found an imago feeding on the leaves of *Polygonum viviparum*, eating from the margin toward the middle rib. Feeding on the grass roots were also a number

of white Coccids. A small yellowish red Scolopendra was frequently found under stones, but here I did not see a dark and larger centipede which is commonly found together with it in other localities. Neither were there any of the naked snails of the genera *Limax* and *Arion* or small shell-bearing snails; but all of these forms I found not far from Svinafeld, at Station Hell. On plants in the pasture were the small *Coccinella 11-punctata*, the *Chrysomela staphylea* and (on *Mercurialis perennis*) *Barynotus Schönherri*. Imagines, eggs and newly hatched larvae of *Aphodius lapponum* occurred in sheep-manure. The small *Bombus jonellus*, the only bumble bee on Iceland, was gathering honey and pollen. The conspicuous Icelandic spider, *Araneus folium*, had fastened its vertical web to grass-straw or irregular pieces of small rocks and spun its vase-shaped house at the lower part of the web. Often a cluster of eggs in a specially woven sack were attached at the top of the house.

In the brook itself I could find no signs of life; and larvae of *Ephemerids* and the Diptera, *Ephydra* and *Simulium*, so common in similar streams everywhere else, were wanting here. The water contained iron and sulphur as shown by the covering of ochre on the upper surface of the stones in the stream, and this may explain the remarkable lack of insect life. Along the edges of the brook run the rather large, black ground beetle, *Patrobus septentrionis*, and the silky brown *Amara Quenseli*, one or two species of *Bembidium* and *Notiophilus biguttatus*, together with the small, lively Hemipteron, *Salda littoralis*.

In this snug and sheltered valley our tents were pitched. The surveying poles were planted nearby, and saucepans, pots and emptied tin cans laid on the grass. There was no difference between day and night. The darkest period was supposed to be at 2:30 in the morning but at that time it was so light that without difficulty I could pin my insects and make notes. We divided the day according to our meals: at 9 A. M., oatmeal and mashed apples; after the meal, observations in the field around the tent, planning of the day's work, reading of barometer and thermometer, bringing the diary up to date; at 11 A. M. a solid lunch with coffee and cigars; then dressing for work, putting on the heavy boots. Dr. Harder rode on horseback to the glacier Flaua-jökul, at a considerable distance from the valley, and I usually climbed up the mountain to study the flora and fauna of the rocks and ponds. The ponies were hobbled and left to roam around in the grassfields. We worked to 8-9 o'clock in the evening and did not have any meals before that time. Then came dinner, a long talk and indoor work. Before we went to bed we always took a big cup of tea with plenty of rum. It was very difficult to sleep in the bright sunlight without a nightcap. The sleep was peaceful and undisturbed. Not a single mosquito was seen or heard or felt on the whole trip and we were not bothered by *Simulium*.

In the valley were several pools of stagnant water that unquestionably dry up later in the summer. Not far from the tent was one of them. It was about 2-3 feet deep. At 8 P. M. the water was 21° C. and the air 16° C. There was plankton in it, consisting mostly of large, orange-colored Ostracodes and small Copepods. The bottom was firm, clayey and entirely inorganic. Above it was half an inch of soft plant and animal detritus with many small earthworms and Trichopterous larvae in conical, smooth tubes of fine grains of sand. The imagines were flying above the pool. In the water were swimming the water beetles *Colymbetes dolabratus*, *Agabus alpestris* and *Hydroporus nigrita*, and also the water boatman, *Arctocorixa carinata*; no molluscs of any kind.

It was to compare the fauna of these marsh-pools with the ponds in the mountains that I made several trips to the latter. A very typical one was located about 150 meters above sea level. I brought with me scraper, plankton nets, a watersweeper, spade, lead, etc. Its depth was 2-3 meters, the temperature of the water the 30th of June was 21° C. and the temperature of the air 18° C. at 2:20 P. M. and 13½° at 6:10 P. M. This pond does not dry up during the summer which explains its comparatively rich fauna and flora. A small mountain meadow surrounded the pond. Around the edge grew *Carex* and *Eriophorum*, and in the water a broad-leaved *Carex* and beautiful *Menyanthis* in flowers. The surface was free from *Lemna*, algae, etc. On the bottom was found first a layer of débris from the vegetation, and below this loose clay. In the clay lived a multitude of red, tube-constructing *Chironomus* larvae and small fragile earthworms. In the débris were two species of Trichoptera tubes, the same conical and smooth one that we had previously found in the pools and another, more cylindrical one which was made of little pieces of *Carex*, also a large species of the fresh-water snail *Limnaeus* and a small bivalve, *Pisidium*. There were a great number of the water boatman and the same three species of Dytiscids as in the marsh-pools; also many Dytiscid-larvae, especially *Agabus*. The plankton was apparently identical in both water types. Altogether the fauna in the shallow pools in the valley possess no form which does not occur in the deeper mountain ponds and the number of the individuals and of the species represented in the shallow pools was much smaller. This different character of the two faunas depends on the temporary existence of the latter and the perennial nature of the former.

From the valley where the tents were pitched one could look over vast, low plains of gravel and sand to the south and southwest. Toward the west a huge, oblong and rounded mountain obstructed any further outlook. It appeared like a monstrous grey whale, a slimy impassable beast stranded on the shore. In

the clear and pure air one could see the broad crossing ridges rising like ribs and bones under the skin; everywhere the water was oozing out and flowing over the sides. Green mucous patches spotted the bare basaltic masses near the plains. The mountain was veiled in a fine bluish haze, the only indication that it was at a distance.

Hidden behind the mountain was the glacier, "Flaua-jökul," the moraines, and the beginning of the sandy plains with rivers fed from the melting glacier-water.

THE SANDY RIVER PLAINS.

The plains of sand and gravel, profusely strewn with rounded stones of many sizes, slope down from the fertile mountain valleys in broad terraces. The entire vast area has been deposited by water from the glacier. The higher lying terraces are the older ones and no longer flooded; but the lower and younger regions are dry only during the summer months. Even at this time there is in many places a broad and extended network of innumerable streams spun from the glacier to the ocean where they develop a wide, marshy and inaccessible delta. In the spring these become deep and dreaded channels hidden in swollen torrents where for hours no ford passable to horses can be found if indeed they can be found at all. From Hornefjord westward, beyond Skeydurásandr, stretching along the south-eastern coastline for more than 200 kilometers, these plains form a narrow strip of land between the highland and the ocean.

To canter over them was a great experience. Never before or after have I cherished a similar romantic and thrilling feeling of unlimited freedom as in those bright days. The common "skuas" or arctic predaceous gulls (*Lestris catarrhactes*) were everywhere, but never in flocks. Croaking and clucking like angry hens, one or two at a time, they would circle around us in low flight like hawks, trying to strike us or our galloping ponies with their wings.

Before we became accustomed to it, it was a most strange and disagreeable sensation to cross the wide rivers with all our horses tied together in one long row. The water flowed fast and the opposite low bank could not be seen. Of course we were riding right through, but it seemed as if the horses were making no headway and all the time were stepping sideways up against the current. When we were in the middle of the river and the water was reaching above the belly of the animals I know that at least I had no idea which way we were headed; the train seemed to go around in a circle all the time. With the boots out of the stirrups and the knees lifted high so as not to become entangled if the horse should stumble, I realized in resigned fatalism my

complete helplessness. I was in the power of the "nökken," the troll of rivers and tarns.

In the older, higher and dryer areas of the plains the stones had a different color from those in the younger and lower areas, being more yellow or greenish gray. This is due to their longer exposure to the air and consequent oxydation. No continuous vegetation covered the bare ground, but plants grew few and far between among the stones. Most characteristic were the grass tufts of *Festuca*, and the cushions of *Thymus*, *Silene acualis* and *Hypnum* moss. *Potentilla*, *Leontodon*, *Cerastium* and *Draba* were present but not common.

In the lower areas the former river channels could always be distinguished from a distance as long, reddish, winding bands, the color originating from the flowers of the grass; but near by, no reddish color was noticed, and the ground was green with the leaves of the grass, the herbs and the dense carpet of moss. A great variation of plants grew here such as the beautiful little fern *Botrychium*, *Carex*, a few dwarfish willows, *Polygonum viviparum*, *Ledum*, *Arabis*, *Cerastium*, *Armeria* and *Taraxacum* (Dandelion).

In some places where the channels were several feet deep they still contained water in oval pools. The water was clear and fairly warm, about 16° C. These pools were filled with typical water and swamp-plants such as the filose Confervae, the globose *Nostoc* balls, *Sphagnum*, *Eriophorum*, *Glyceria maritima* and strong, fine plants of *Pinguicula*.

Near the ocean the country becomes more and more marshy, and the reddish bands run together making a uniform reddish sod in which the same plant types were found as in the channels.

The animal life of the higher areas of the plains was extremely poor. A few *Notiophilus* and in some places small companies of a little brown Hemipteron were seen running over the sand. *Byrrhus* and *Otiorrhynchus arcticus* were found under the scattered tufts of grass and *Thymus*. The larvae of *Otiorrhynchus* were feeding on the grass-roots. Around the flowering *Thymus* different kinds of Syrphids and *Calliphora erythrocephala* were buzzing and at least two species of *Agrotis* were active, sucking the honey; but most of these insects were unquestionably incidental visitors coming from the mountain pastures.

In the dry parts of the lower regions the insects were the same as in the higher regions, only even scarcer. In the small pools, however, there was a surprising amount of life and here a true ecological association of different forms was displayed. Chironomid larvae in tubes of slimy dirt almost covered the submerged stones. On the bottom, the common trichopterous larvae in conical smooth sand-tubes were crawling slowly around. Swarms of their clumsy, brown spotted imagines whirled and fluttered in the air, and together with them were the imagines

of the Chironomids and a small whitish moth. The imagines of the water beetle *Agabus alpestris* were common. Usually they were found standing vertically in the water with the head right down and moving in quick, short jerks. They fed on the Chironomid larvae on the stones. There were also Ostracods and numerous *Limnaeus* snails. *Salda* was running on the water's edge. Occasionally in the larger pools one of the peculiar small wading birds, *Phalaropus hyperboreus*, was seen swimming around, feeding on insect larvae, Ostracods and other water animals not being too large to swallow.

"FLAUA-JÖKUL."

Plants and Insects in the Old and Recent Moraines.

For the last half century the glaciers have been moving backward in that part of Iceland which we were studying. In this period, however, the retrograde movement of the ice has not been unceasing and continuous. On the contrary, the movement has been oscillating. For a while the front wall of the glacier was on a standstill. Then for a series of years it receded. Again it did not change location for another series of years. Then it advanced for a while over the ground which it had just uncovered; but afterwards the backward motion was reiterated, and so forth.

Gigantic terminal moraines are formed during the periods of rest in which the melting processes of the ice equalize the forward movement of the entire glacial system. Hills of immense stones, huge pieces of ice, smaller stones, gravel, sand and clay, saturated with water, all mixed together without stratification are unloaded at the foot of the towering walls and overhanging cliffs of ice.

Thus during the general retrogradation of the glacier several parallel series of terminal moraines are created. In many localities these are easily distinguished and in one place, at station "Fell," Dr. Harder was fortunate enough to obtain definite chronological records of the ages of the different moraines and the various movements of the glacier from the year 1869 to the year of our expedition.

Here at "Fell" the basaltic rocks, the fertile mountain-valley and the old river-plains look strikingly like the corresponding geological formations at "Svinafell" with which we just have been dealing; and the glacier, "Breidamerkur-jökul," is not very different from the glacier "Flaua-jökul" west of the whale-like mountain at "Svinafell." At "Fell," however, two low moraines are found to define the higher and lower terraces of the plains, indicating where the glacier formerly stood at the end of two different periods which, according to information obtained, were in 1873 and 1886. With these two periods

given, it became possible, by a fortunate coincidence of causes, to synchronize both the ages of the terraces themselves and their fauna and flora, as follows: 1. The river which now flows close to the foot of the present glacier has moved with the ice from the east-most of the two moraines to its present bed, and consequently the ages of the two terraces are determined by the years of the moraines and are respectively from some time before 1873, and from between 1873 and 1886. 2. In 1873 the river completely destroyed the grassfields formerly growing here, as proven by the large flakes of dead and often overturned sod now scattered all over the higher terrace. Thus it can be definitely stated that the vegetation and the fauna migrated into the higher terrace after 1873 and into the lower terrace mainly after 1886. In the region between the moraine of '86 and the glacier there is little or no plant and animal life.

At a certain place the south end of the glacier almost reaches the Atlantic Ocean, being separated therefrom only by a land-bridge less than 10 kilometers (about 5 English miles) wide, outside of which lies a laguna with brackish water and a narrow sand-bar about 140 paces across. The bridge consists of four parallel series of terminal moraines with dells between and pools and ponds both on the top of the hills and in the bottom of the dells. The moraine close to the laguna dates from 1869, and the two following moraines are from 1877 and 1895. On the side of the 1895 moraine, facing the ocean and near its top, is an indistinct wall representing the moraine of 1886; and facing the glacier but at the foot of the 1895 moraine is a small 1901 moraine. Between the latter and the glacier is a chaotic conglomeration of ice-blocks, water, muddy clay and rocks.

At "Flaua-jökul" the landscape from the glacier toward the ocean and the river-plains is characterized exactly like that at "Fell," by parallel series of moraine-hills indicating a creation at different periods. At least three series are present, each constituting a definite type, similar to the ones found at "Fell." Unfortunately, however, at "Flaua-jökul" the exact age of the moraines could not be obtained; and therefore the length of the epochs of the different floristic and faunistic ecological associations could be estimated only by comparison with the records from "Fell." Otherwise, the natural conditions of the moraine landscape at "Flaua-jökul" offered much better opportunities for a study of the question which principally interested me, namely the sequence in which the plants and animals migrated into the land and the lakes created by the receding glaciers, and the physical conditions determining the sequence.

Farthest off from the glacier, the hills, corresponding to the moraine walls of 1869 at "Fell," are rounded, the ponds and pools oval, rather large and with flatly concave bottom, and the whole landscape is undulating. In the middle series of moraines

corresponding to those from 1877 to 1895 at "Fell," the material has not been exposed to rain and decomposition as long as in the older moraine, and the sliding down of earth and stones and leveling of the surface has been active for a shorter period. Therefore the hills are pointed or have sharp crests, and the pools on the top of the hills or in the valleys are circular and smaller. Their bottom is more funnel-shaped and they are apparently, but not really, deeper than in the outer moraine. The inner moraine is in a chaotic state. There are no definite hilltops and pools; but everywhere heaps of gravel, stones, ice and water.

As to the flora and fauna of these localities, the interesting fact was discovered that plants and animals are advancing right to the ice, though life, of course, is developed to its highest degree of variation and abundance in the outer moraine.

The order in which the migration progresses and the moraines are populated is best realized by the study of the pools and ponds.

In the outer-moraine these are inhabited by a characteristic flora of perennial flower-plants such as: *Batrachium* with white petals fully out below the water surface, *Myriophyllum*, one species of *Potamogeton* with narrow, grass-like leaves and another species with broader leaves. At least two species of *Limnaeus* snails were feeding on the plants. Phytoplankton was present in great quantity but the Zooplankton was sparse. There were plenty of threadlike Confervae from which Haliplid larvae were sucking the juice. Red Chironomid larvae, *Tanytus* and other nemocerosus larvae live in the detritus on the bottom. *Arctocorixa* and three different Dytiscids are feeding on them. In these old ponds Phryganeid larvae were present, and the stones were covered with furcate colonies of Bryozoa. To some of the ponds "Stickle-backs" (*Gasterosteus aculeatus*) had found their way from inlets with brackish water, causing a change in the described ecological association. The water boatmen and water beetles disappeared. Either they must have been eaten, probably while in the larval stage, by the fishes or the latter had gorged themselves so thoroughly on the worms and larvae in the mud and on the stones that nothing was left to the predaceous insects. Investigation of the stomach content did not give definite results. Terns (*Sterna*) were flying over the ponds in an endeavor, I suppose, to catch the fishes, many of which were infested with large tape-worms, one to each fish.

In the ponds belonging to the middle moraine no flowering plants occurred, but Confervae were present and there were many Nostoc balls. Ostracoda and Phytoplankton were plentiful. The Nemocera larvae in soft dirt-tubes, so common everywhere, were attached to the stones and another form of Nemocera in a thick gelatinous bag, was floating calmly in the

surface. The latter form was present in quite large numbers and was very characteristic for the waters in the middle moraine, but was rare or absent in all other places. There were many larvae and adults of *Agabus* and *Hydroporus* and also of the water boatman *Arctocorixa*; but the Phryganeid larvae were absent because the water contained too large an amount of unsettled clay. There were no *Gasterosteus* and no snails.

In the puddles and water holes of the inner moraine a fine, slightly greenish tinge from innumerable microscopic algae was noticeable on the muddy clay-bottom. Feeding on this fine filament were a surprising quantity of the universally present *Nemocera* larvae in tubes of dirt; and on these the larvae and adults of *Agabus alpestris* and *Hydroporus nigrita* were preying.

The microscopic algae, the *Nemocera* larvae and the two species of *Dytiscids* are the pioneers of organic life in the waters of the moraines. Unquestionably they came from the ponds and pools of the older moraines; but the organic life is indigenous to neither the older nor the newer moraines, for, with a single exception (the stickle-backs) the plants and animals have found their way to the moraine landscape from the marshes in the mountains or the valleys at the foot of the mountains.

The factors which determine the different character of the organic life in the ponds and pools of the moraines are the amount of clay precipitated in the water, the depth, the size and the age of the ponds, but not their location in respect to the glacier.

At "Graenafell" near station "Heineberg" a pool was found on top of a moraine-hill barely within the distance of a gun shot from the ice and yet with a flora and fauna almost identical with and as rich as that in the ponds of the oldest moraine here at "Flaua-jökul." But the water in it was very clear, and the bottom consisted of sand instead of clay. The size of the pool was 10 by 50 paces. It was one-half meter deep. The temperature of the water on the 13th of July was 17°C., and that of the air 12½°C.

The water in the puddles of the inner moraine is usually milk-white, the ball of the thermometer in some cases disappearing when 3 centimeters down. No plants other than the *Confervae* and the microscopic algae and no other animals than those characterized above as "the pioneers" seem to be able to live in them.

The ponds in the moraine landscape, especially those close to the glacier, are neither very large nor deep, and are therefore easily heated. In the mountains it is different. There we often find large and deep lakes bordering on the ice masses and having ice-floes drifting around in the matter. No organic life is found here.

The age of the waters in the moraines is an important factor

to consider in connection with the development of their organic life. The dilution and washing out of the clay takes a long time and so does the deposition of a layer of detritus on the bottom to make it fitted for the growth of flowering plants and the snails, bivalves, fish and birds which follow.

The general character of the land vegetation changes in the direction of the glacier, corresponding to the situation existing in the waters; but the changes are more gradual and the modifications characterized more by a continuous diminution of the number, and usually also of the vigor of the individuals in the different zones than by a reduction of the species represented.

The outer region seems to extend from that side of the oldest moraine which faces the ocean to the crest of the hills of the middle moraine. The middle region goes from here to the top of the inner moraine; and the third region occupies all the remaining space to the foot of the glacier.

In the outer region the vegetation has commenced to form a continuous sod of grass, mostly *Poa* and moss; but it covers the ground rather imperfectly and in many places the plants stand widely apart. There are also *Equisetum*, *Scirpus*, *Juncus* and many of the beautiful perennial herbs of the pastures and the fertile places in the river plains, for example, *Saxifraga*, *Thymus*, *Silene acaulis*, *Silene nutans*, *Dryas*, yellow and white *Galium*, *Cerastium*, *Arabis*, *Draba*, *Armeria*, *Sedum*, *Rumex*, *Papaver nudicaule*, etc. A few low willows are also found.

In the middle region the plants grow in small and weak tufts behind the larger stones. There is much more uncovered than covered ground. Nowhere is a continuous growth found; but the plant species are the same as in the outer region. Small round cushions of moss and lichen, one-half to one foot apart, are frequent and characteristic for this region.

The third region appears at the first glance almost dead, but weak crusts of lichen are attached in spots to the stones, and fine, green young moss plants peep up in the hollow places. On the stones around the water holes are thin grey films of dried Confervae. This growth is called "Tönder," is very inflammable and formerly was used with flint in tinder-boxes. Here and there, many fathoms apart, one can find a tuft of grass, a single *Cerastium*, a *Papaver*, a *Saxifraga*, etc.

The insect fauna is also very limited. There are *Otiorrhynchus* and *Byrrhus*, both hard-shelled beetles which are rolled around and widely scattered by the heavy wind-storms. There are Noctuids such as *Agrotis* and *Hadena*, good flyers who find honey in the flowers and carry pollen from plant to plant. Larvae were found of all these forms, proving that they belong here. *Armeria* was visited by large flies such as *Phormia coerulea*. In the flowers of *Saxifraga* two or three small species of parasitic Hymenoptera were commonly found, but no other insects; and,

reversely, parasitic Hymenoptera were not taken in any other flowers. In the low land of the middle moraine the dark sand at the bottom of flat deepening is at times under water and at times drained and merely moist. This was the case on the day when the following observations were made.

The entire bottom surface was ornamented with an irregular arabesque-like system of slightly elevated long, tubular galleries. The width of the galleries was about equal to the size of a pin head. In the anterior part of each gallery was found a cylindrical, whitish, Tipulid larva (*Hedobia hybrida*) about 1 mm. long. Very often one-third of a broken pupal skin was sticking out of the mouth of a gallery. The imagines were present in great numbers, some flying close to the ground, others resting on it. They are long-legged and capable of running over the water film. The eggs were found on the moist surface, singly or in small masses of two or three. The larvae feed on organic particles in the sand. The imagines take no nourishment, but copulate as soon as they are developed. They were not found in any other places than the moist ground where they had lived as larvae. A small ground beetle (*Bembidium islandicum* Sharp), was running around in comparatively large numbers, both imagines and mature larvae being represented. Evidently they are preying on the larvae of the *Helobia*. On the imagines a small black spider was feeding. It did not make a regular web but spun a number of single threads, each about two feet long, attaching them to a piece of gravel and, starting from this as a common center, spread the threads close to the ground like radii, fastening the ends to small grains of sand.

The fauna of the outer region is like the flora, much richer than that of the two inner regions, particularly in the number of individuals. It takes a long time to develop a soil sufficiently fertile to produce a continuous sod with a definite ecological association of flowering plants and insects. Age, therefore, is a main factor determining the different character of the terrestrial organic life in the moraines. In fact it is almost the only one. That the proximity of the ice has no more influence on the terrestrial life than it had on the aquatic life here is very clearly brought out by the following experience.

On August the eleventh we visited a small locality on "Breidamerkur-jökul." The place was, as far as I remember, about 30 feet square and located right upon the glacier about 60 meters above the base of the inner moraine. The ice was covered by a layer of sand and gravel about $\frac{1}{4}$ meter thick, and a great number of large stones were spread all over it. The spot had been a resort for gulls. Many feathers were lying around and excrements were scattered all over the ground. There were numerous vertebrae and smaller and larger parts of fish-skeletons. Near the ground a fairly strong odor of fish was

noticed. The large stones were separated from the ice by a stratum of grass roots and plant detritus about 1 mm. thick, and below this by a layer of basaltic soil only 2 to 3 mm. thick. In this locality I found a dense and various vegetation of *Poa* grass, *Festuca rubra* with rust-fungi, *Cerastium*, *Arabis*, *Spergella*, *Saxifraga* and *Sedum*. There were no predominant species, but all specimens were strong, healthy and in full bloom, the yellow flowers of the thick blocks of *Sedum* being particularly pretty. Large flies, such as the blue *Phormia coerulea* and *Calliphora erythrocephala* were buzzing. A single specimen of a *Syrphus* was seen hovering in the air. A small Pyralid was caught flying. Several parasitic Hymenoptera were swept from the flowers, and there were plenty of adult Trichoptera. In the thin stratum of debris and grass roots under the stones several gray Podurids were taken, also two adult Carabids and two Carabid larvae, many Staphylinids representing different genera, and a small red Trombidiid. The same small black spider, which was studied in the lowlands of the moraines, was found here and its web was on the ground. When I visited the place the day was bright and it was warm in the sunshine, but after I had been lying down for a short while to collect under the stones I began to shiver. It really is astonishing how little the plants and insects were affected by having the ice underground.

It is quite evident that the entire terrestrial flora and fauna found in the river plains as well as in the moraines originate like the aquatic ones, from the marshes, meadows, ponds and grass fields of the mountain valleys. The different organisms found there have spread all over the rest of the country, flying, crawling or being passively distributed by many agencies. The wind, rivers, birds, man and domestic animals have carried seeds and other parts of plants, eggs of snails and insects and often entire animals such as small crustaceans or the hardshelled and easily rolled Curculionids and Byrrhids.

By comparison with the flora and fauna of other northern countries it is furthermore demonstrated that at least the majority of the plants and animals of the mountain valleys are identical with those occurring in the Scandinavian peninsula. This is not surprising when we remember that Iceland at the time of the Vikings was colonized by Norwegians and that the chiefs and their men and families brought with them horses, sheep, cows, chickens, dogs, hay, grain and timber. It also was customary, as told in the Sagas, to carry soil to the new land from the old homesteads.

As Iceland was completely covered with ice during the glacial period all organic life of the periods prior to the glacial must have been destroyed. It is, for instance, not thinkable that any of the present-day organisms can have developed here from terti-

ary forms like those which are found as fossils in the large clay deposits in some of the basaltic rocks.

On the contrary, some of the plants and animals originally introduced by the Vikings may have become extinct, or they may have died out in most parts of Iceland, but still be living in remote and isolated places.

This latter suggestion was advanced by Thoroddsen. In particular he called attention to the fact that the old peculiar race of small hens raised by the Vikings still is living in the isolated Öräfa district but nowhere else, and also that mice and rats are lacking here; and he believed that an entomological and botanical investigation of the district might disclose further evidence of his theory.

Off hand I did not believe that plants and insects occurring on both sides of the Öräfa district would be absent here, like the rats and mice are. I hardly could imagine that an isolation effected by comparatively narrow glacier-tongues, rivers and the ocean could prevent organisms so small and easily carried as plant seeds and insects from being introduced, when men with horses and hay every year are passing through this country on their way to Reykjavík and back. The probability of finding forms limited to Öräfa seemed also somewhat remote.

However, the question ought to be considered and the Öräfa district which is immediately to the west of Station "Fell" had to be visited before we started on our return trip to Horneffjord. To get into Öräfa, with the whole outfit of our expedition, was a difficult problem, as the unusually deep and furiously rapid river, "Jökul-á," separates the district from that part of the country where we had been studying. To cross this river was impossible. It was necessary to take the horses over the glacier above the immense gate through which the river is bursting out, roaring and foaming. The one way to accomplish it was, first to ascend to the top of the mountain plateau which is about on the level with the upper surface of the glacier, and then to proceed from here out on the ice.

THE EDGE OF BREIDAMERKUR-JÖKUL ABOVE JÖKUL-Á.

In the beginning we had trouble with the horses. They had been bought from the farms near the plains and were steady trotters, absolutely reliable in the rivers, and good mountain climbers; but not accustomed to the ice and, for this reason, nervous. The strong mountain winds ("phoens") carry much dust and the glaciers are spotted with small, dark mineral deposits of basaltic origin. In sunshine the ice, of course, melts quicker below these spots than outside of them. The horses being unfamiliar with the shiny ice always tried to step on the

dark dust, but slipped on account of the water below and missed their foothold. An accident happened which also frightened them. We were trotting along in a row with the old local guide in the lead, none of us in the saddle, and I closing the ranks. We came to a round pool, as far as I remember about 50 square feet large. It looked very shallow and I wondered why the guide was leading the expedition around it instead of going right through. My riding horse, just in front of me, evidently had been thinking like its master. Being young and lively it followed its impulse and stepped right out in the pool; but this was a very deep hole, undoubtedly melted by a hot spring in the rock below the glacier. The pony disappeared before my eyes. Shortly after I saw it lifting its head over the water. It was swimming. Then it tried to get a foothold on the ice edging the hole, and we placed horseclothes there to help it. In vain. Not carrying fire arms we were forced to leave it to drown for we had already given more time than it was safe to spend on the glacier. After having travelled quite a distance from the hole we heard the horse coming. How it had managed to save itself I can not tell.

The surface of the glacier near the edge is not at all smooth and even. It looks like an immense camp of small conical tents, all covered with black dirt. Farther in from the edge it becomes more flat and is in many places a beautiful, polished, dark blue. At the bottom the cracks and crevasses reflect colors of a pure delicacy, serene light blue or hyaline green. Everywhere water is purling. In many places it disappears in remarkable, cylindrical, oblique and very deep conduits in the ice. Most of them are six inches to one foot in diameter, and inside are clear blue. All the time a monotonous, vibrating sound was heard. Now and then a single clear note, as if produced by a gigantic tuning fork, arose from the deep of the gapes.

Twice each month the mail-carrier is scheduled to arrive. Before his arrival the "glacier-man" has to indicate the way either with arrow-marks cut deep in the sides of the ice walls or with wooden sticks in places where particularly dangerous situations are ahead. These are usually caused by the deep cracks that temporarily burst open as the result of the movements of the glacier. Sometimes one will have to follow along a crevasse to the end of it and back again on the opposite side, but often natural bridges of ice connect the edges. Some of the bridges were not much wider than a meter. To pass them was not perilous for any of us men, only very disagreeable to myself as I suffer from dizziness. But to lead or force the horses over them was a difficult affair.

On our way up through the mountains it had been raining all the time and our breeches and boots were dripping wet. On the glacier the weather was fine, but heavy clouds and the fog were

coming up. It was a great relief to us all when we realized that the trail was winding downward to the terminal moraine.

We had spent five and one-half hours on the glacier. Finally we were in Öräfa, the home of hot springs and volcanic forces, but generally more characterized by the different activities of the water in all its conversions.

ÖRÄFA AND RETURN.

In Öräfa I had the opportunity to study the remarkable organic life in a hot-water creek. It was more than 40 C. and so hot near its source that I could barely put my hand into it and grab handfuls of the gelatinous blue-green algae and green Confervae that grew therein. In this medium were living the larvae and pupae of a fly, a species of *Ephydra*. The imagines were sitting in great number on the upper surface of the algae and had laid their eggs here. Small parasitic Hymenoptera were swarming among the flies. Inside of the hyaline algae small snails were plentiful.

Near the hot-water creek was a plot of good sized birch trees, a regular little grove. Its name is "Bäjarstadr-skogen." Naturally it is the pride of the district. Thrush (*Turdus*) was found here, and the birds were making a great noise, one of them imitating the croaking of ravens. The whole flora and fauna in this wood were remarkable and rather rich. There were, however, no Cerambycids and no bark beetles; but a small, globular, hard, black mite made galleries which looked like short bark beetle galleries.

As explained above, the main object for visiting Öräfa was partly to search for plants and insects special to the mountain valleys, river plains and moraines of this district, and not found in the corresponding localities east of Jökul-á, and partly to find out if any of the forms occurring in this latter part of the country were lacking in Öräfa.

The results were in both respects negative as far as one is able to judge from provisional studies in the field.

The short Icelandic summer was almost at an end. Crowberries, blueberries and blackberries were ripe. The weather was becoming more and more unsettled and windy. The short, melancholic fall and the long winter-time were at the door. We were in a responding mood. We had had an overdose of isolation, and it was "with dry eyes we wept" over the prospect of a speedy return to civilization.

A DIASPINE WITH LEGS (HOMOPTERA: COCCIDAE).BY GLADYS HOKE, *Converse College, Spartanburg, S. C.*

The specimens from which this species has been described are, so far as is known, the first adult female diaspsines on which legs have been recognized. They were received by Mr. J. Forrest Crawford at the University of Chicago, from the Botanist at the American University of Beirut, Syria, and were sent to the Bureau of Entomology, U. S. D. A., for identification. Mr. Harold Morrison of the Bureau very kindly extended to me the privilege of describing the species.

***Leucaspis knemion*, new species.**

Female puparium.—Color white, of normal form, consisting of the brownish larval and nymphal pellicles covered with a white waxy coat a trifle larger than the nymphal pellicle which shows slightly through the wax; entire scale 2 to 4 mm. long (figs. 2, 3).

Immature female.—Larval pellicle light to dark brown in color, with well developed legs and antennae. Nymph with three pairs of rudimentary legs, marginal fringe and ceratubae extending cephalad to a point beyond the meso-legs. Nymphal pellicle (figs. 1, 5) heavily chitinated, dark brown in color; body finely perforated in mosaic-like pattern with the exception of a small area on anterior margin; segmentation of abdomen distinctly indicated on dorsum, less distinctly on venter; rostrum nearer to anus than anus is to posterior margin of pygidium; legs in normal position on venter; lobes, marginal fringe and ceratubae as in figures, occasionally with slight variations.

Male puparium.—Color white, 1.5 to 2 mm. long, larval pellicle light brown.

Adult female.—Body enclosed within nymphal pellicle; twice as long as broad, cephalic end as broad or broader than caudal end, broadest across thorax; rudimentary antenna consisting of prominent tubercle bearing 5 conspicuous setae, a seta on the derm in close proximity to tubercle; tentorium well developed, of medium size; ventral surface with two groups of about 50–60 ceratubae caudad and laterad of the tentorium, thorax bearing 3 pairs of conspicuous rudimentary legs, prolegs between anterior spiracles and tentorium, mesolegs about midway between anterior and posterior spiracles, metalegs caudad of posterior spiracles, and nearer to them than are the mesolegs; a group of 4–15 cerores cephalad of anterior spiracles. No cerores associated with posterior spiracles; ventral derm finely marked with irregular bands of tiny scallop-like protrusions on meson between tentorium and pygidium; each of the two abdominal segments anterior to the pygidium bearing near each lateral margin a group of accessory genacerores numbering 4–9, rarely with one of the anterior groups missing or with a few ceratubae associated with the cerores (fig. 4).

Pygidium.—Lobes in 2 pairs, heavily chitinated, bluntly pointed and tapering to distal end, one to two pairs of less heavily chitinated lobe-like processes on each laterus; plates slightly longer than median pair of lobes and slender, entirely fringing margin of pygidium and numbering about 70–100, frequently with one or two distinct pectinations, 2 pairs of plates between median pair of lobes and two or three between median pair and second pair of lobes; a long seta associated with each median lobe on dorsal surface, 5 pairs of well developed

marginal setae on ventral surface; genacerores in crescentic formation, numbering 14-20 (19-34), 12-18, with 3-3 or rarely 2-0 a short distance caudolaterad of last group, mesal group sometimes fused with one of the groups on either side, a group of 4-8 accessory genacerores on each side cephalolaterad of the anterior group; ceratubae arranged in a band conforming to margin and numbering about 100; dorsal surface with irregular oblong patches of denser chitin, usually 10 in number, which may or may not be associated with ceratubae; anal aperture surrounded by an area more highly chitinated than the adjacent derm; vulva nearer to caudal margin than is anus (fig. 7).

Host.—*Pinus pinea*.

Locality.—Beirut, Syria: April 18, 1923.

Types.—In the U. S. National Collection of Coccidae. Two slide mounts from the type material were sent to Mr. E. E. Green, for an opinion regarding the correctness of the interpretation of the ventral thoracic spine-like structures as legs. Slide mounts of two larval pellicles, one nymph, five nymphal pellicles, and five adult females were examined.

This species can be distinguished from *L. pini* Hartig, apparently its nearest relative, by the presence of 3 pairs of rudimentary legs in the nymph, nymphal pellicle and adult female, by the presence of 3 pairs of groups of accessory genacerores, by the greater number of plates on the pygidium, by the absence of cerores associated with the posterior spiracles, and by the greater proximity of the rostrum of the nymphal pellicle to the posterior margin of the pygidium. In the nymphal pellicle the distance between the anus and the rostrum is less than the distance between the anus and the posterior margin of the pygidium, while in *pini* the distance of the rostrum from the anus is from 2 to 2½ times as great as the distance from the anus to the posterior margin. There is also a difference in the number and arrangement of the ceratubae on the pygidium and a difference in the pygidial and lateral fringe.

Some of the distinctive characteristics of *knemion* and the following species of *Leucaspis* which occur on *Pinus* are indicated in the chart. Types were not available for study in making these comparisons and all of the data concerning the species that are marked with a star were taken from published descriptions and figures of these species.

EXPLANATION OF PLATE I.

Leucaspis knemion, new species.

Fig. 1. Pellicle of nymph, $\times 21$.

Fig. 2. Dorsal aspect of puparium.

Fig. 3. Ventral aspect of puparium.

Fig. 4. Adult female, $\times 48$.

Fig. 5. Pygidium of nymphal pellicle, $\times 96$.

Fig. 6. Mesothoracic leg of adult female, $\times 424$.

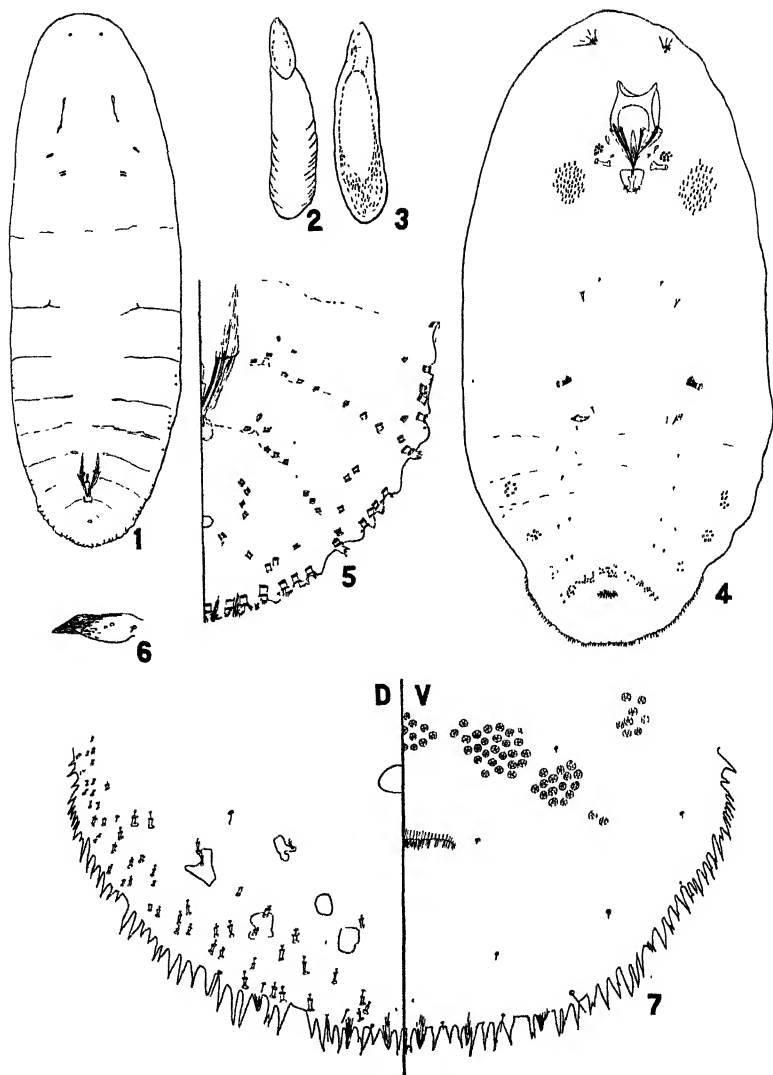
Fig. 7. Pygidium of adult female, $\times 184$: D. Dorsal aspect. V. Ventral aspect.

COMPARATIVE CHART SHOWING CHARACTERS

SPECIES	GENA- CERORES	ACCESSORY GENACERORES	LOBES
<i>knemion</i>	14-20 19-34 (12-18)+ (3-0)	3 paired groups: 4-8 on pygidium, 4-9 on each of the 2 segments immediately anterior to pygidium	2 pairs and 1-2 pairs of lobelets
<i>pini</i> Hartig	11-13 15-17 10-12	2 paired groups of 2-4 on the 2 segments immediately anterior to pygidium	3 pairs and 1 pair of lobelets
<i>pusilla</i> Loew	9 10-11 10-6	0	1 pair and 1 pair of lobelets
<i>perezi</i> Green*	single arch of 30-45	0	3 pairs narrow
<i>signoreti</i> Targ.*	18 21-22 24-25 <hr/> 11 20-17 10-9	9 - 6 on the 2 segments immediately ante- rior to pygidium, 5 - 3 on third segment anterior to pygidium	3 pairs short
<i>india- orientalis</i> Lindg.*	0		0
<i>loewi</i> Colvée	16 14-10 13-15	0	3 pairs and 2 pairs of lobe-like protru- sions

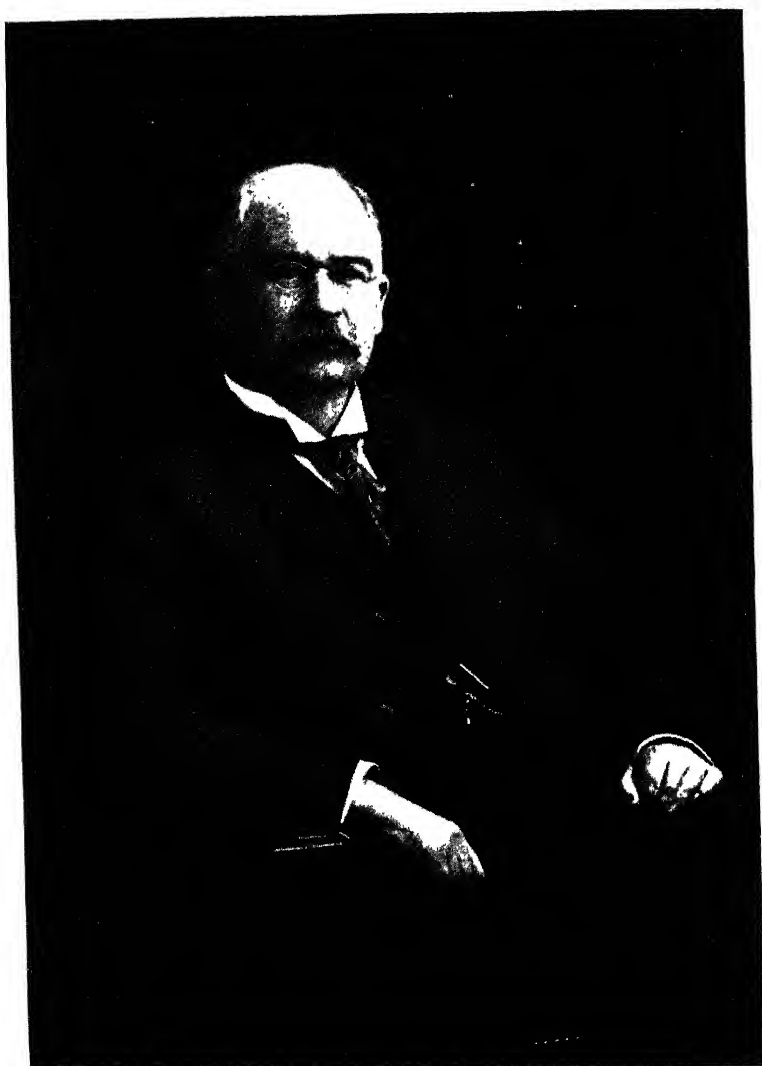
OF LEUCASPIS SPECIES ON PINUS.

PLATES	ANTERIOR SPIRA- CERORES	POSTERIOR SPIRA- CERORES	LEGS	ROSTRUM OF NYMPHAL PELLICLE
70-100 slightly longer than lobes	4-15	0	3 pairs rudi- men- tary	slightly nearer to anus than anus is to poste- rior margin
about 42 much longer than lobes	9-11	2-3	0	twice as far from anus as anus is from poste- rior margin
occasionally fused, at least twice as long as lobes	5-6	0	0	twice as far from anus as anus is from poste- rior margin
26-32 twice as long as lobes	5-6			just below center of body
62 much longer than lobes				
	0	0	0	
			0	



HOKE—A DIASPINE WITH LEGS.

Actual date of publication, March 14, 1925.



COLONEL THOMAS LINCOLN CASEY.

PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

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In Memoriam

The following resolution was adopted by The Entomological Society of Washington February 5, 1925.

With the death of Col. Thos. L. Casey the Entomological Society of Washington has lost one of its oldest and best known members, a genial companion, a profound student and the author of an extensive and important series of works on the beetles of America, printed chiefly at his own expense and distributed with rare generosity to other students.

The Society feels its loss and wishes by this resolution to express its sincere sympathy for the bereaved family.

COLONEL THOMAS LINCOLN CASEY.

BY E. A. SCHWARZ AND W. M. MANN.

Thomas Lincoln Casey was born at West Point, New York, February 19, 1857.

His early education was obtained in private schools, after which he studied at the Sheffield Scientific School of Yale in 1874-75 and then entered West Point, from which he graduated in 1879. He received his commission in the Engineer Corps of the Army and remained there, passing through various grades to Colonel, until 1912, when he retired.

In 1882, as a young Lieutenant, he was a member of the Astronomical Expedition to study the transit of Venus, and visited the Cape of Good Hope. At different times field work in engineering, studies of river and harbor improvements and duties connected with the Light House Board, of which he was Chairman, took him to various parts of the States.

To Colonel Casey, the classification and description of adult beetles was a diversion, but not his only hobby, for Conchology took up a considerable part of his time and he made notable collections of fossil shells of the Lower Mississippi and published on the family Pleurotomidae. From his pen came also papers on Astronomy as well as on military engineering and other subjects connected with his official work.

His engineering instincts and training are shown in the exactness of his systematic writings and in the exquisitely prepared specimens of his collection, as well as in his method of work. For years before his retirement but two hours each afternoon could be devoted to systematic work on insects. This time he spent with mathematical regularity in the "beetle room" at his apartment, with specimens, note pad and binocular microscope in front of him; and it is from these leisure hours that we have the greater part of his studies on the Coleoptera.

The first entomological work of Colonel Casey was published in 1884 when a few short notes on beetles were printed in the Bulletin of the Brooklyn Entomological Society, followed the same year by five other papers, one of them a monograph on the American Cucujidae and another an extensive study of the subfamily Stenini. From then on he was one of the most prolific writers on Coleoptera. Up to 1910 he had published about 50 papers, some of them monographic in scope, and treating complicated and often neglected families.

In 1910 appeared the first volume of his notable series "Memoirs on the Coleoptera," which was completed with Volume II in 1924. In these volumes he departed from his earlier field and included descriptions of Central and South American species.

These papers were published and distributed privately. The Colonel had usually defrayed the cost of publication of his papers when published in other journals. In the distribution of the separates, he showed an intelligent generosity. In addition to his mailing list he dispatched bundles of separates to different entomological centers with instructions that copies be given to deserving students.

Colonel Casey died February 3, 1925. With him passed one of the most prominent of a generation of amateurs, a small group of earnest Coleopterists to whose industry we owe much of the present accepted classification of American beetles.

He was buried at the National Cemetery at Arlington, Va., with military honors. At the wish of his wife, Laura Welsh Casey, the microscope that had become so much a part of the Colonel's life was placed in his casket.

With the advancement of science always in mind, he bequeathed his entire estate to scientific societies and his collections and exceptionally complete library to the United States National Museum.

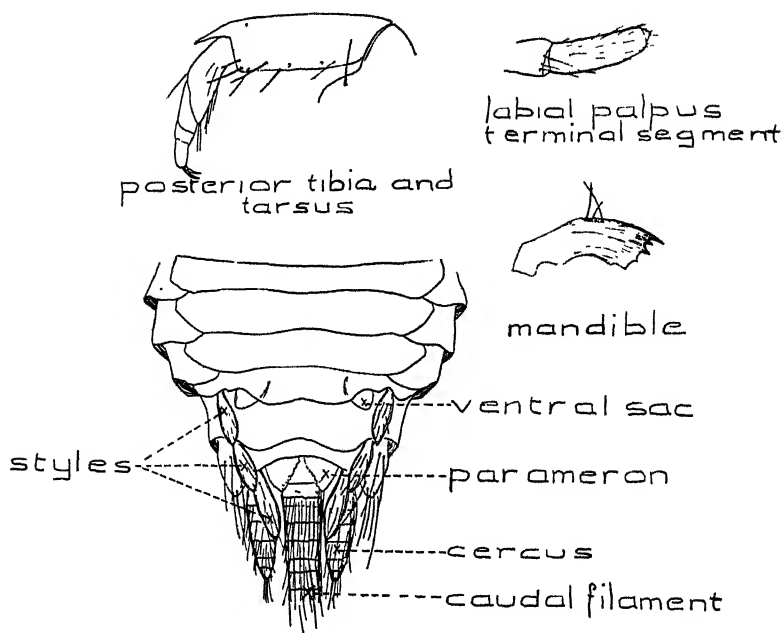
Colonel Casey was a charter member of the Entomological Society of Washington, and the records show that he was one of six members present at the second meeting, which took place on October 2, 1884, when he presented one of the three papers of the evening.

A NEW SPECIES OF MYRMECOPHILOUS THYSANURA FROM BOLIVIA.

BY A. N. CAUDELL, *U. S. Bureau of Entomology.*

Atelura manni, new species.

The insect described and figured below apparently belongs to the lepismid genus *Atelura* of Hayden and, like many of its allies, is interesting by having the scales of the body replaced for the most part by hairs or bristles. Escherich, *Zoologica*, Heft 43, 1905, has monographed the Lepismidae and given a key to the species of *Atelura*. So far as listed by the Zoological Record, which has been consulted as far as yet issued, the last volume seen being that for the year 1922, no species of this genus has been described which is at all liable to confusion with the one here characterized. Since the monograph of Escherich nine species of *Atelura* have been described from the Old World, while only five New World forms have been described. The New World species include four termitophilous species from British Guiana described by Folsom and a Mexican form described by Silvestri under the synonymic genus *Grassiella*. As the present species from Bolivia apparently differs materially in various respects from all described forms it is here described as new under the specific name *manni*, being dedicated to its collector, Dr. Wm. Mann.

Fig. 1. Details of *Atelura manni*.

Description.—(Male, female unknown). Moderately large for the genus and the general color reddish-brown, lighter beneath and with the tip of abdomen with its appendages yellowish. Head crushed in capture but showing the following features: Antenna incomplete, the remaining segments beyond the simple first and second closely connate and each with a couple of rings, making the whole appear as if formed of numerous very short segments; eyes absent; mandibles but moderately chitinized, and furnished with three sharp teeth on one-half of the apical margin, the other half irregular, as shown in the accompanying figure; both pairs of palpi with the terminal segments four or five times as long as thick, being more elongate than ordinarily the case in these insects.

Thorax broad, dorsally strongly convex, slightly longer than the abdomen, posteriorly broadening and with the surface almost bare as seen under even the highest power of the binocular (85 \times), a few hairs only seen along the margins; the pronotum is about a third longer than either of the other thoracic segments, which are subequal in length. Abdomen short and broad, anteriorly as broad as the posterior width of the metanotum but rapidly tapering posteriorly; its dorsal surface strongly convex and bearing a few fine hairs and with numerous long stiff hairs or bristles, which are directed posteriorly, along the lateral margins; without scales so far as discernible with the binocular; there are nine dorsal and eight ventral segments visible; the cerci and caudal filament are imperfect, having the tips broken off, the remaining portions covered with stiff, posteriorly directed hairs; cerci apparently about as long as

the mesonotum and distinctly segmented; the parameres very light in color, and triangular in shape, the bases slightly separated, the outer margins curved and the inner margins oblique, as shown in the figure; the seventh, eighth and ninth ventral segments each bearing a pair of lateral styles which are hairy and directed posteriorly, those of the ninth slightly longer than the others, being a little more than one-half as long as the cerci; near the inner margin of the base of each style on the seventh segment is a short ventral sac, whitish in color and about as long as broad, the length no more than the width of the adjacent style.

Legs with broad coxae as characteristic of these insects.

Measurements.—Length, total to tip of abdomen, about 4.5 mm.; thorax, 2 mm.; pronotum, 1 mm.; abdomen, exclusive of appendages, 1.5 mm.; width, across metanotum, 2.5 mm.

Type-locality.—Cachuela Esperanza, Beni, Bolivia.

Described from a single dried specimen, the male type, collected in March, 1922, near the center of a marching colony of the army ant, *Eciton vagans* Ol. by W. M. Mann, entomologist with the Mulford Expedition to South America.

Type.—Cat. No. 27885, U. S. N. M.

Eliminating from section 6 in Escherich's key the character of being termitophilous this species runs to category 10. It differs very decidedly, however, from both species (*termitobia* and *synoiketa*) which run out at category 10, by being much larger than either of them as well as by being myrmecophilous instead of termitophilous. The partial absence of antennae makes it impossible to decide under which alternate of category 10 it would go. From the species described by Folsom from British Guiana this form seems unquestionably distinct, being decidedly larger in size, found associated with ants instead of termites and by various morphological characters.

The nakedness of this species may be due to excessive rubbing during capture, but careful examination fails to show traces of scales. This absence of scales, if real rather than apparent, would prohibit this species being referred to *Atelura* as treated by Escherich, who described that genus as composed of species with the body covered by scales. *A. manni* can not be relegated to any other described genus known to the author and if it does not belong to *Atelura* it must represent a new genus. It is thought best to refer it to *Atelura*, at least for the present, especially as some of the species of that genus appear to have the scale covering of the body very inconspicuous.

A NEW NORTH AMERICAN GENUS OF MICROLEPIDOPTERA (GLYPHIPTERYGIDAE).

By AUGUST BUSCK, *U. S. Bureau of Entomology.*

Ellabella, new genus.

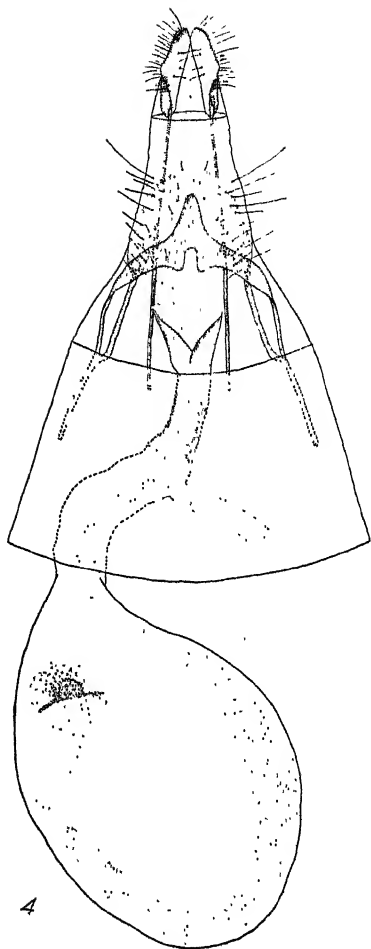
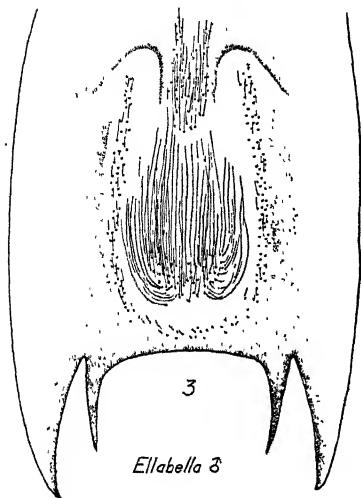
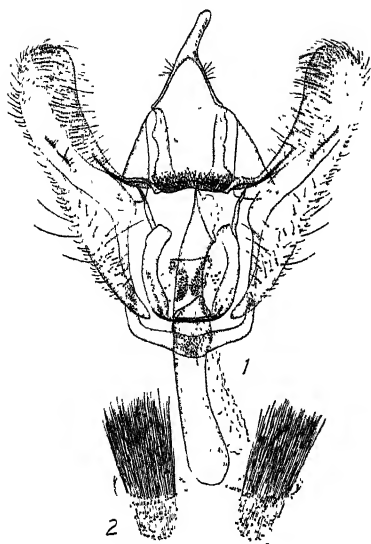
(Plate 3.)

Antennae simple, 2/3, very shortly ciliate in the male. Tongue well developed, spiraled, scaled at base. Labial palpi long, straight, nearly smooth, porrected; second joint long, slightly thickened with scales, loosely applied above; terminal joint short, blunt. Face smooth; head with loosely applied scaling; thorax with posterior scaletuft. Forewings elongate ovate; apex pointed; with raised scaletufts; 12 veins; all separate; 1b furcate at base; 1c present, strong throughout; 2 from outer fourth of cell; 3, 4 and 5 equidistant, from end of cell; 7 to termen. Hindwings slightly broader than forewings; without pecten at the base of the cell; costa straight; termen and dorsum evenly rounded; 8 veins; 3 and 4 connate; 5 nearest 6; 6 and 7 parallel; 8 free. Posterior tibiae smooth. Male genitalia (Fig. 1) with well developed uncus, bluntly pointed; gnathos strongly armored with numerous stout spines; transtilla narrow bandlike (in the figure the central part of the transtilla is obscured by the spined part of the gnathos); socii absent; harpes simple with a costal and a dorsal fold; vinculum narrow; anellus with two lateral strongly chitinized processes and two hairy palpifers; oedeagus long, stout, pointed; penis without cornuti. Female genitalia (Fig. 2) with the lobes of the ovipositor small, narrow and curved so as together to form a tube, open in front; genital plate large, triangular, well chitinized and placed in the intersegmental skin well behind and quite separate from the genital opening (a very unusual character); genital opening large and funnelshaped; ductus bursae rather short and wide, slightly chitinized below the genital opening; bursa copulatrix with large spined signum, the edges of which are not strongly defined against the surrounding granulated part of the bursa.

Type.—*Ellabella editha* Busck.

The genus is nearest to and probably correlated with *Lotisma* Busck, which has nearly the same venation as this genus, differing mainly in having veins 3 and 4 of hindwing stalked, instead of connate; the genitalia, however, present several important differences, which definitely separate the two genera. In *Lotisma* the gnathos is absent, the transtilla is divided and reduced to spined processes from the harps; the harps are highly developed with strongly chitinized claw-like process on the dorsal fold. All of these characters show a considerable advance over *Ellabella* and together with the more advanced venational character indicate possibly a derivation from, rather than a correlation with that genus.

The genus *Araeolepia* Walsingham, which also belongs in this immediate group, but which has veins 3 and 4 of the hindwing widely separate, approaches *Lotisma* in the divided transtilla and the armed harps, but has retained the gnathos as has



Ellabella ♀

BUSCK—NEW NORTH AMERICAN GENUS.

Ellabella and is at once differentiated from both by the very different hoodlike, broad uncus and the pointed vinculum.

Ellabella editha, new species.

Labial palpi and face mouse-gray, speckled with white. Vertex ochreous white. Thorax ochreous brown with a broad transverse fascia of white; posterior tuft dark brown. Forewings whitish overlaid with ochreous, brown and black scales and with three illdefined transverse lines of black, forming strong tufts of raised black scales on the cell; the outer one is surrounded by a dark circular line and gives the impression of an indistinct eyespot, especially in slightly rubbed specimens; outer third of the wing slightly overlaid with light brown and irregularly dusted with black scales; a series of blackish spots, intervened by gray, along costal edge from basal fourth to apex and a much less pronounced series of dark spots along the terminal edge; cilia mouse-gray. Hindwing light brownish fuscous with lighter cilia. Abdomen ochreous fuscous. Legs and underside ochreous.

Alar expanse.—19–22 mm. The females average larger than males.

Habitat.—Quamican Lake, Vancouver Isl., Saanickten, British Columbia. E. H. Blackmore, Coll. Waterton Lakes, Alberta, Canada. McDunnough, Coll.

Type.—Cat. No. 28055 U. S. N. M.

Paratypes.—U. S. N. Mus.; Coll. Blackmore; Can. Nat. Coll.

The drawings were made from slides, prepared by the writer, and under his supervision, by Mr. Harry Bradford of the U. S. Bureau of Entomology.

EXPLANATION OF PLATE 3.

Fig. 1. Male genitalia of *Ellabella editha* Busck.

Fig. 2. Scaletufts in pockets on underside of abdomen in intersegmental skin between seventh and eighth segment.

Fig. 3. Scaletufts in depression on underside of abdomen on first to third segment.

Fig. 4. Female genitalia of *Ellabella editha* Busck.

ON THE GENUS *SETIOSTOMA* ZELLER (LEPIDOPTERA:
STENOMIDAE).

BY AUGUST BUSCK, U. S. Bureau of Entomology.

(Plate 4.)

In a paper dealing with other forms (Can. Ent., vol. 53, p. 279, 1921) the writer incidentally pointed out that a study of the genitalia proves the genus *Setiostoma* Zeller to belong in the family *Stenomidae* and not in the *Glyphipterygidae* as had hitherto been supposed.

At the time, no drawing of the genitalia was available, but I am now able to present the evidence by figures of the type of the genus, *Setiostoma xanthobasis* Zeller (Fig. 1), which clearly demonstrates the family relations of the genus. For comparison the genitalia of a typical Stenomid, *Stenoma querciella* Busck is given (Fig. 2).

I am indebted to Mr. Harry Bradford of the Bureau of Entomology for the excellent drawings, made from my slides.

The genus *Setiostoma* has the following characters:

Antennae $\frac{3}{4}$, in the female shortly pubescent, in the male with very long, 5-6, soft ciliation on the underside, a striking character, not mentioned, strangely enough, by either Zeller or Riley; no pecten on basal joint. Labial palpi upturned, reaching above vertex, slightly thickened with rough scaling, terminal joint nearly as long as second, somewhat flattened, pointed. Face, head and thorax smooth-scaled. Forewings with costa and dorsum parallel, apex bluntly pointed, termen straight, oblique; 12 veins, all separate, 2 from middle of cell, 3 from outer fourth of cell, 4 from end of cell, 7 to costa or apex, 1b furcate at base, 1c traceable in the entire length, but tubular only on outer fifth. Hindwings broader than forewings, costa straight, apex blunt, termen and dorsum evenly rounded, semicircular; 8 veins; 3 and 4 stalked, 6 and 7 stalked, 5 nearest 4. Posterior tibiae smooth, except for small tufts between the spurs. Male genitalia with uncus pointed; gnathos a simple band; socii absent; transtilla absent; harpes simple with sixlobed, palmate hairs on outer part of costa; vinculum narrow, incomplete in front, anellus with two upright flattened processes; oedeagus very large with pointed apex; cornuti a large cluster of small spines apparently cemented together to form one whole and one (or more) large single spines (the genotype has one such single spine, while *Setiostoma fernaldella* Riley has six).

Setiostoma is a tropical American genus with a single species, the genotype, occurring in temperate North America. The larvae of *S. xanthobasis*, Zeller, feeds between leaves of oak, spun together with silk. In the latitude of Washington the larvae are found in May and in July, the pupation takes place between the leaves in a small silken cocoon and the moths appear in June and in August; there is presumably a third generation with overwintering larvae or pupae. The larva is a very brilliantly colored caterpillar with pale green groundcolor; head, thoracic shield and anal plate yellowish brown; second and third thoracic segments vivid crimson; first abdominal segment whitish, unmarked; the rest of the abdominal segments marked with series of wine-red blotches around the setal tubercles, which are large and deep red, except the dorsal series around setae 1 and 2, which are shiny yellowish brown. Setal arrangement gelechioid. Prolegs with uniordinal hooks in a single circlet, broken inwardly.

The tropical species of the genus, as far as known, feed on *Ficus*.

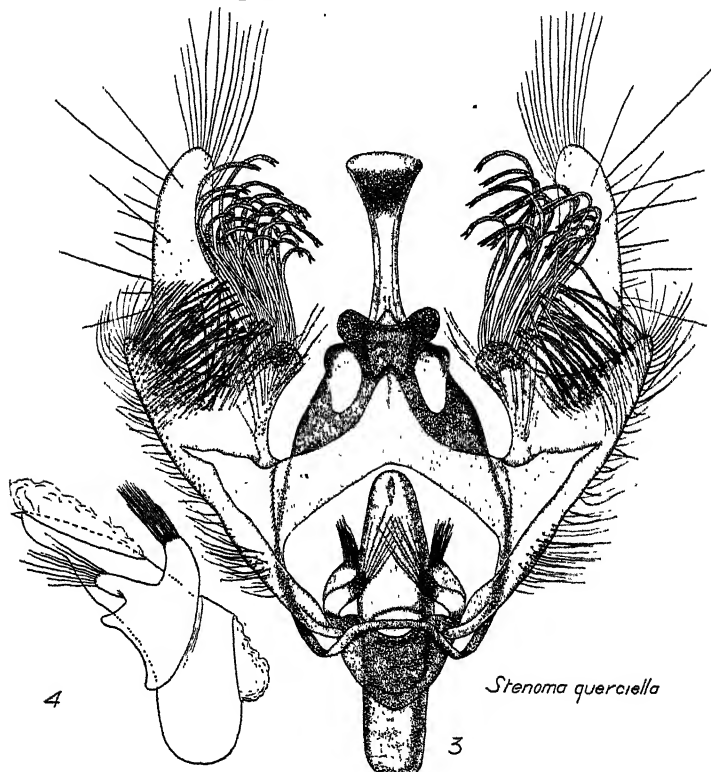
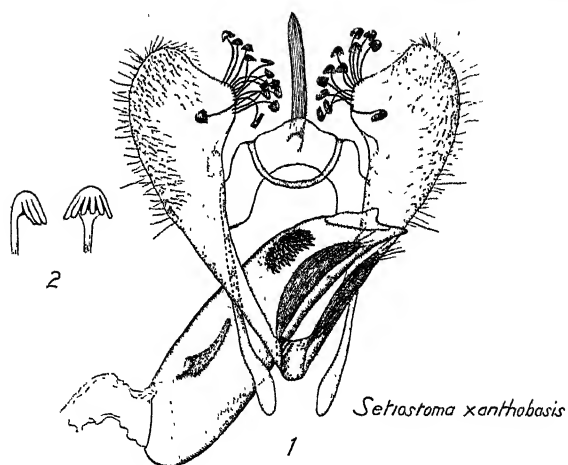
EXPLANATION OF PLATE 4.

Fig. 1. Male genitalia of *Setiostoma xanthobasis* Zeller.

Fig. 2. Palmate hairs on harpes (greatly enlarged).

Fig. 3. Male genitalia of *Stenoma querciella* Busck.

Fig. 4. Oedeagus and anellus (side view).



REVISION OF THE GENUS NEOASCIA WILLISTON (DIPTERA: SYRPHIDAE).¹

By C. HOWARD CURRAN, *Ottawa, Ontario.*

Meigen established the genus *Ascia* in 1822, and this name had been used without question by succeeding authors until 1886, when Williston changed the name to *Neoascia* because of the previous use of the name *Ascia* by Scopoli for a group of Lepidoptera. Apparently Scopoli's use of the name has never been accepted and consequently the use of *Ascia* for this group of Syrphidae has prevailed elsewhere than in North America until quite recently.

The genus comprises the smallest species of Syrphidae and is characterized by a constricted abdomen, arista shorter than the antennae, eyes separated in both sexes; apical crossvein more or less rectangular and joining the third vein well before the wing tip.

All the known species are closely allied; in almost all the epistoma is produced, the lower sides of the front is pale haired in the ♂; the hind femora are incrassate, black, almost always yellow at the base, with rather conspicuous spinules below, the hind tibiae somewhat arcuate.

The term, "occipital cilia," is used to denote the longer hairs on the occiput above. The apical crossvein is the vein closing the first posterior cell, which I have termed the "apical cell."

TABLE OF SPECIES.

Males.

1. Front four legs wholly yellow.....*albipes* Bigot.
At least the front femora or tibiae with a strong black or brown band....2.
2. Fifth sternite not over half as long as wide; third tergite with a rather narrow, interrupted or entire yellowish basal fascia; genitalia large, somewhat globose.....*sphaerophoria* n. sp.
Fifth sternite at least three-fourths as long as wide, genitalia of normal size..... 3
3. Abdomen with two yellow fasciae or four spots.....4.
- Abdomen either immaculate or with only one band or two spots5.
4. Front femora with the basal fourth or more yellowish; second abdominal fascia usually interrupted.....*globosa* Walker.
Front femora black quite to their base or only very narrowly yellow; second abdominal fascia never interrupted.....*metallica* Williston.
5. Abdomen immaculate6.
- Abdomen with yellow markings.....7.
6. Small species, the pile of the mesonotum yellow or even whitish, color blue-black or steel blue.....10.

¹Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa, Canada.

Larger, 5 mm. or more, the pile of the mesonotum tawny; the distance between the anterior ocellus and base of the antennae is much greater than the width of the front..... *distincta* Williston.

7. Front four tibiae wholly yellow or with a faint reddish band, third antennal joint twice as long as wide, facial pubescence silvery.....

distincta Williston.

Front four tibiae with blackish bands on apical half. Third antennal joint not over one and one-half times as long as broad; facial pubescence with yellowish tinge.....8.

8. Posterior femora unusually swollen, one-third as wide as long.....

macrofemoralis, n. sp.

Posterior femora normal in size, not one-fourth as wide as long.....9.

9. Third antennal joint scarcely longer than broad, its apex truncate; second and third joints of hind tarsi whitish yellow..... *unifasciata*, n. sp.

Third antennal joint almost one and one-half times as long as wide, its apex almost evenly rounded, hind tarsi wholly blackish..... *conica* n. sp.

10. Occiput black pilose above; front bluish-black with steel blue reflections, the distance between the anterior ocellus and base of the antennae is less than the width of the front..... *subchalybea*, n. sp.

Occiput pale pilose above the cilia sometimes black; front greenish black; the distance between the anterior ocellus and base of the antennae is much greater than the width of the front..... *minuta*, n. sp.

Females.

1. Anterior four legs all yellow..... *albipes* Bigot.

Anterior femora or tibiae with brown or black band.....2.

2. Abdomen without yellow markings.....3.

Abdomen with yellow spots or bands (sometimes small).....6.

3. Front tibiae wholly yellow; face scarcely produced..... *distincta* Williston.

Front tibiae annulate with black or brown; epistoma moderately or strongly produced.....4.

4. Face oblique, evenly produced to tip of epistoma..... *sphaerophoria*, n. sp.

Face perpendicular or almost so above, the lower part conspicuously produced.....5.

5. Front almost as wide as long; the lower part of the face very strongly produced, abdomen bronze-black..... *conica*, n. sp.

Front distinctly longer than wide, abdomen greenish black, smaller species..... *minuta*, n. sp.

6. Only the second abdominal segment with a pair of yellow spots.....

metallica Williston.

Either with four pairs of spots or two bands or only the third segment maculate.....7.

7. Second and third segments each with a pair of spots or bands.....10.

Only the third segment with a pair of spots.....8.

8. Front tibiae entirely yellow, hind femora of normal size..... *distincta* Williston.

Front tibiae with black band, hind femora unusually swollen.....9.

9. Face oblique, scarcely concave..... *sphaerophoria*, n. sp.

Face distinctly, though not strongly concave..... *macrofemoralis*, n. sp.

10. Front femora yellow on basal fourth or more; face evenly greyish white pruinose..... *globosa* Walker.

Front femora with less than the basal fourth yellow, usually black to the base; face usually shining black towards the sides....*metallica* Williston.

***Neosciasia subchalybea*, new species.**

Front blue-black, wider than one eye; face deeply concave, almost flat on upper fourth, very strongly produced; antennae wholly black; legs much darker than usual.

Length, 5 mm. *Male*: Face blue-black, moderately whitish pollinose, the white pile conspicuous, in profile almost flat on upper fourth and level with the eyes, thence obliquely produced to the lower fourth, thence much more strongly produced to apex, this lower portion being almost parallel with the oral margin below, the lower margin slightly oblique. Front slightly over one-third as wide as the head, blue black, with blackish pile, wholly gently convex, a small, longitudinal median depression. Occiput blue-black, black pilose on upper half, white below. Antennae wholly blackish brown, third joint oval, one and one-half as long as wide, rather flattened above; arista about as long as third joint, thickened on basal half.

Thorax blue-black, the pleura polished black below; pile of moderate length, whitish.

Coxae blue-black, the front ones more brownish. Femora black, the front four very narrowly, obscurely reddish at base, their apices reddish, hind ones with the basal sixth reddish; trochanters mostly brownish. Tibiae blackish, only the narrow bases and very narrow apices reddish. Tarsi brownish yellow. Posterior femora six times as long as wide.

Wings cinereous hyaline; stigma luteous; discal crossvein very slightly oblique, slightly sinuous; apical crossvein oblique and slightly curved outwardly, its junction with the fourth vein angularly rounded. Abdomen wholly steel blue, its disc scarcely darker, its pile wholly whitish.

Holotype.—♂, Montreal, Quebec, May 20, 1906. No. 619 in Canadian National Collection.

Quite distinct from any other species on account of the wide front, black pilose occiput, small size and bluish color. The wide front at once distinguishes it from *minuta* which has a narrow front and yellow haired occiput.

***Neosciasia minuta*, new species.**

Small, wholly dark species, the abdomen bluish with polished, greenish blue terminal segment, face almost evenly concave but less strongly so above.

Length, 4 to 5 mm. *Male*: Face black, densely greyish yellow pollinose, its whitish pile conspicuous; in profile almost evenly concave, less strongly so above, the oral margin as prominent as the apex of the second antennal joint; face sometimes more flattened on upper two-thirds and the oral margin less prominent. Front about one-fifth the width of the head, one and one-half times as long as wide, bluish but with a brassy reflection in middle; pile black, yellow on lower third. Occiput greenish or bluish-black, with yellowish pile, which becomes white below, the occipital cilia black or largely yellow. Antennae black, third joint reddish on lower basal half; arista brown, thickened

on basal fourth, about as long as third joint; third antennal joint elongate oval, one and one-half times as long as wide.

Thorax greenish black, the lower half of the pleura blue-black; pile short, yellowish. Coxae black, the front ones more brownish. Front four femora black, their apices broadly yellow, their bases very narrowly obscurely so; hind femora greenish black with the basal sixth or less, and narrow apex, reddish. Tibiae yellow on basal two-fifths and apex. Tarsi yellow, posterior basitarsi, and last two joints of hind tarsi, black; anterior basitarsi, last two segments of front four tarsi and middle two of hind tarsi reddish brown. Posterior femora about four and one-half times longer than wide, widest at middle.

Wings slightly tinged with brownish; stigma luteous; discal crossvein rectangular or nearly so; apical crossvein recurrent, slightly curved, its junction with the fourth vein sharply rounded.

Abdomen blue-black, its margins and last segment metallic greenish black. Pile yellowish; a narrow apical incomplete fascia of black pile on second and third segments.

Female: Front one-fourth the width of the head; occipital cilia yellow; face slightly variable in profile, more flattened on upper three-fourths than in the type ♂ and more like the paratype.

Legs more evidently paler, the femora all narrowly pale. Posterior femora slightly narrower.

Holotype and *allotype*.—♂, ♀, "Colorado," No. 28169 in U. S. N. M.

Paratypes.—♂, ♀, same data, No. 621 in Canadian National Collection, Ottawa. One paratype in U. S. N. M.

The small size of this species renders it conspicuous. While occasional specimens of other species may be as small, their specific characters, coloration, etc., will readily distinguish them. The specimens were included with *N. distincta* Williston in the National Museum collection but that species has wholly yellow front tibiae.

Neoscia distincta Williston.

Neoscia distincta Williston, Syn., p. 112, 1886.

Female wholly black, rarely with an interrupted reddish fascia on the third segment; ♂ always with a reddish fascia; terminal abdominal segments metallic; front and middle tibiae wholly yellow.

Length, 4 to 5.5 mm. *Male*: Head black; face densely silvery white pruinose, entirely obscuring the ground color; in profile perpendicular on the upper two-thirds, thence produced to the tip of the oral margin which is about as prominent as the apex of the first antennal joint; hairs about the oral opening very indistinct. Front below with a few transverse striae and just above these numerous longitudinal, less distinct ones, the middle more or less brassy. Pile yellowish on lower half, black above. Occiput greenish black, lightly dusted; pile pale yellowish. Antennae brown, third joint reddish below on basal half, slightly over twice as long as wide, its apex obtusely rounded, inclined to be truncate above; arista brownish, thickened on basal third, as long as third joint.

Thorax blackish green, pale yellow pilose; pleura lightly whitish pruinose on upper half, and with whitish pile.

Coxae black, their tips, trochanters, base of hind femora, broad apices of the front four and tips of the hind ones and the tibiae and tarsi yellow; femora, hind basitarsi and last segment of hind tarsi black. Hind tibiae with narrow brown ring beyond the middle, the anterior four slightly darker.

Wings hyaline, stigma yellow. Discal crossvein rectangular, the apical one a little oblique so that the first posterior cell is slightly longer anteriorly and the crossvein is slightly curved.

Abdomen deep bluish-black, the sides bronzed, the last segment metallic greenish with a strong brassy reflection. Third segment with a basal yellow band occupying a little more than half the segment but well separated from the lateral margin. Pile of abdomen pale yellowish, but small apical triangles on the disc of the second and third segments, black.

Female: Face and front wider; the former with the pollen not nearly so abundant and the hairs about the mouth more distinct. Front slightly bronzed, purplish or greenish, with pale yellow pile except across the ocellar triangle.

Abdomen sometimes with the third and following segments slightly purplish bronzed or greenish or with the third segment black except the sides.

A female taken on May 5, in company with the others, may belong here: the face is slightly more evenly produced and the third abdominal segment has a basal interrupted reddish yellow fascia.

Over 50 specimens from Ontario and Quebec (Curran); ♀, Coldstream, Ont., May 25, 1922 (A. A. Wood).

I took a series of over fifty specimens of this species at Orillia in 1921 and recognized it as distinct from *globosa* Walker at that time, but identified it as *metallica* Williston.

Neosascia unifasciata, new species.

Face strongly produced; third abdominal segment in both sexes with an entire or subinterrupted reddish yellow basal fascia; anterior four tibiae with blackish bands; second and third joints of hind tarsi yellow.

Length, 4.5 mm. *Male:* Face densely pale greyish yellow pruinose, with conspicuous hairs along the mouth opening; in profile gradually produced from the upper fourth, so that the anterior oral margin is almost as prominent as the tip of the second joint of the antennae (when correct), very slightly concave. Front shining black, with a brassy reflection, its pile pale below and at the vertex, black or brown on upper two-thirds; on the middle with a few transverse, faint wrinkles, but no longitudinal ones. Occiput thinly greyish pruinose, with white hair below, yellowish above; occipital cilia not black. Antennae black; third joint brown, reddish below, scarcely longer than broad, its end obtusely rounded; arista almost as long as the last two joints combined, brown, with a yellow base.

Thorax shining greenish black, the pleura and sides of the dorsum with whitish pollen and pile; the disc of the latter with black pile, bordered by tawny and of a darker, more bronze ground color.

Coxae black, their apices broadly, trochanters, bases of femora, broad apices of the front four and narrow apices of the hind femora, basal half and apices of the tibiae, and all the tarsi pale yellow, first and last two joints of the front and hind tarsi and last two of the middle ones, black or brown; basal fourth of hind femora yellow.

Wings slightly fuscous; stigma fuscous; posterior angle of first posterior cell rounded, its crossvein rectangular; discal crossvein almost rectangular.

Abdomen deep black, the second segment with rather abundant, short, appressed brownish yellow hair, giving a dirty appearance to the segment; fourth segment metallic greenish black. Pile on the base and sides whitish; elsewhere yellowish; third segment with a transverse yellow fascia on the base, occupying slightly over half the length of the segment and not quite reaching the side margins.

Female: Face less densely pruinose; front without wrinkles or striae; with the usual transverse depression and a rather conspicuous longitudinal groove above; pile wholly shorter; third antennal joint nearly one and one-half times as long as broad.

No black pile on the thorax, that on the disc tawny.

Yellow abdominal band subinterrupted by a black projection in the middle posteriorly, and almost or just reaching the lateral margins.

Holotype.—♂, Aweme, Man., August 11, 1917 (N. Criddle), No. 548, in the Canadian National Collection, Ottawa.

Allotype.—♀, collected by Mrs. W. W. Hippisley, at Dauphin, Man.

This species is closely related to *conica* but is readily distinguished by the less concave face, shorter antennae and yellow median segments of the hind tarsi, although this latter character may be variable. The wings are darker and the female of *conica* has no yellow abdominal fascia.

Neoscia conica, new species.

Abdomen of male with a yellow fascia on the base of the third segment; of female wholly black; face strongly produced, antennae short; tibiae with black bands.

Length, 5.5 mm. *Male*: Face densely pale yellowish pruinose, somewhat less so below; the pale hairs extending broadly to the lower side margins; in profile concave on upper fourth, thence produced, the production more marked below, so that there is a very evident concavity; the oral tip as prominent as the base of the arista when antennae porrect. Front shining greenish black, the middle brassy; without striae or wrinkles; brown pilose except on the sides below. Occiput very thinly whitish pruinose, its pile yellow, including the occipital cilia. Antennae black; third joint reddish beneath; about one and one-half times as long as wide. Arista black.

Thorax shining greenish black, its disc somewhat brassy; pile yellowish; a broad sub-median, abbreviated stripe black, especially noticeable behind the middle; pleura thinly whitish pruinose, with white pile.

Tips of the front coxae, all the trochanters and narrow bases of the femora, the hind ones more broadly, apices of the femora, the hind ones narrowly, basal

half and apices of the tibiae, middle two joints of the front, basal three of the middle tarsi and under side of median joints of the hind ones yellow; elsewhere black.

Wings cinereous hyaline; stigma pale yellow. Apical and discal crossveins rectangular, the posterior angle of the first posterior cell not or scarcely rounded.

Abdomen blue black; fourth segment metallic greenish black; basal reddish yellow fascia of the third segment occupying about half the length and distinctly separated from the side margins by a metallic greenish stripe. Pile on base, side margins and most of the fourth segment, whitish; on the disc, blackish, less widely so on the anterior of the second and third segments.

Female: Face thinly whitish pruinose, in profile less prominent on the upper portion, the lower portion produced as much as in the male, the concavity therefore much more evident. Front broader and somewhat swollen, the transverse depression incomplete, the longitudinal groove broad and deep; pile black across the ocellar triangle, elsewhere whitish; front unicolorous, slightly bronzed.

Thorax wholly whitish pilose. Apical crossvein with a slight curve at posterior corner of first posterior cell.

Abdomen wholly bronze-black, with whitish pile; rather robust.

Holotype.—♂, Banff, Alta., June 1, 1922 (C. B. D. Garrett), No. 549, in the Canadian National Collection, Ottawa.

Allotype.—♀, Banff, May 29, 1922 (C. B. D. Garrett).

This species was possibly included by Williston under his *metallica*. It is quite distinct from all others, its outstanding characteristic being the remarkably produced face and short third antennal joint.

Neosasia sphaerophoria, new species.

Male with an interrupted or entire basal reddish fascia on third abdominal segment; female with an obscure fascia; tibiae with black bands; ♂ genitalia very large.

Length, 5 to 5.5 mm. Face yellow pruinose, the whitish hairs above the oral margin very distinct and extending to the side margins, in profile strongly produced from the upper fifth, not concave, the tip of the oral margin about as prominent as the apex of the second antennal joint when the antennae are perfect. Front shining black, more or less brassy or bronzed; below with a few transverse wrinkles; brown pilose except on the sides below; occiput thinly yellowish pruinose; yellow pilose. Antennae black; third joint brown; yellow on basal half below; third joint almost twice as long as broad, its apex obtusely rounded, never inclined to an angle above; arista black.

Thorax shining greenish black, with tawny pile; that on the disc mostly black; on the pleura more whitish.

Coxae with the tips of the front ones, trochanters, bases of hind femora; apices of the front four and sometimes the hind ones narrowly, basal third or less of the tibiae and their apices, first three joints of the middle tarsi and median two of the front ones, more or less yellow or whitish; legs otherwise black.

Wings cinereous hyaline, stigma pale yellow; apical and discal crossveins rectangular, the posterior angle of the first posterior cell angular or slightly rounded.

Abdomen bluish-black, the fourth segment metallic, sometimes bronzed or brassy; the basal reddish yellow fascia on the third segment may be broadly interrupted in the middle or entire and reaches the lateral margin or almost so. Pile rather long, yellowish; on the posterior half of the second, and third and base of the fourth segments, black, but nowhere reaching the sides. Genitalia unusually large.

Female: Facial pollen paler, whitish, and much less abundant; front yellow pilose on lower half and at vertex; in the middle with a conspicuous depression.

Thorax wholly yellow pilose on the dorsum. The spots on the abdomen are not reddish, but are metallic.

Holotype.—♂, Banff, Alta., June 15, 1922 (C. B. D. Garrett); No. 547, in the Canadian National Collection, Ottawa.

Allotype.—♀, same locality, June 1, 1922.

Paratypes.—5 ♂, same locality, May 27th to June 16th, 1922.

The large genitalia of the male are quite distinctive. The longer antennae, large posterior femora, two-spotted or immaculate abdomen, and straight produced face distinguish the female from allied species.

Neoascia macrofemoralis, new species.

Large species, the face evenly produced to tip of oral margin; posterior femora larger than in most other species; third abdominal segment with an entire basal fascia (♂), a broadly interrupted fascia (♀).

Length, 5.5 to 6 mm. *Male*: Face brassy black, moderately covered with greyish yellow pollen; in profile almost evenly produced to the tip of the oral margin, narrowly flattened just below the antennae where it is almost on a level with the eyes, lower margin slightly evenly produced downwards. The short, sparse, white facial pile extends down nearly to the oral margin of the slopes. Front nearly twice as long as wide, strongly brassy, the supra-antennal depression large, with a few oblique striae below; pile short, black across the ocelli, elsewhere yellow. Occiput greenish black, with almost white pile. Antennae black, the third joint reddish on basal half below; in outline the third joint oval, one and one-half times as long as wide; arista as long as third joint, thickened on basal half.

Mesonotum black, slightly bronzed, with very short whitish pile; pleura black, brassy above, their pile white; scutellum rather brassy, with yellowish pile.

Coxae black, the apices of the front four yellow. Front four femora black, their very narrow bases and broad apices reddish yellow; posterior femora with the basal fourth and very narrow apex reddish yellow; tibiae with the basal third or more and the apices, reddish yellow, tarsi yellow, the last two joints and hind basitarsi black; front four basitarsi and median joints of hind tarsi more or less fuscous above. Posterior femora greatly swollen, widest at the middle, about three times as long as wide.

Wings cinereous hyaline, stigma luteous, discal and apical crossveins rectangular, very slightly curved.

Abdomen deep bluish-black, the sides bluish; the last segment metallic, blackish green; third segment with a reddish fascia which reaches the sides in its full width, and occupies about the basal half of the segment. Pile chiefly whitish; black on apical half of second, and third segments except laterally. Fifth sternite as long as wide, the genitalia normal, rather flat, not swollen.

Female: Face distinctly concave, the lower part more strongly produced than in the ♂; front wider, one and one-fourth as long as wide.

Posterior femora smaller than in ♂ but distinctly larger than in most species.

The fascia on the third abdominal segment is broadly separated from the side margins and is interrupted in the middle by a distance almost equal to the length of one of the spots; in width the spots occupy about the basal third of the segment.

Holotype.—♂, Popoff Island, Alaska, July, 1899 (T. Kincaid); Harriman Alaska Expedition, No. 28170 in U. S. N. M.

Allotype.—♀, same data.

Paratype.—♀, same data, No. 620, in the Canadian National Collection, Ottawa.

This species is closely related to *N. sphaerophoria*, but the male is readily distinguished by the small, not swollen genitalia. The female can not be readily separated from *sphaerophoria* female, but the face is distinctly concave and it is slightly larger. The legs are practically the same in both these species.

Neosciasa metallica Williston.

Ascia metallica Williston, Pr. Phil. Soc. XX, 35, 1882.

Ascia nasuta Bigot, An. Ent. Soc. Fr., 327, 1883.

Ascia quadrinotata Bigot, l. c.

Neosciasa globosa var. *metallica*, Willst. Syn., 112, 1886.

Abdomen with two bands or four spots; rarely with only two spots on the second segment; tibiae with black bands, anterior femora black to base or only narrowly yellow basally; face of ♀ usually shining.

Length, 4.5 to 6 mm. *Male*: Face thickly pale yellowish pruinose, the whitish hairs above the oral opening extending to the side margins and rather conspicuous; in profile perpendicular on the upper fourth, thence strongly produced, the tip of the oral margin about as prominent as the middle of the second antennal joint when antennae are correct; the lower portion almost straight but usually very slightly concave. Often the eyes obscure a view of the upper portion of the face from direct lateral view. Rarely the upper half of the face is perpendicular in which case the lower portion is distinctly concave. Front shining black, distinctly bronzed; polished in the middle on the lower fourth, above which, on either side are four or five longitudinal striae. Pile black; on the sides below and on the occiput pale yellow or whitish. Occiput thinly greyish pruinose along the eyes. Antennae black; third joint, reddish at base below, twice as long as wide, its end evenly obtusely rounded; arista black.

Thorax metallic greenish black, the lower half of the pleura shining black, the upper half thinly whitish pruinose. Pile yellowish, including the pleura; black on the disc.

Legs black; apices of coxae, most of trochanters; anterior femora beneath basally, sometimes the narrow base, bases of middle femora, apices of anterior four femora and rarely the narrow apices of hind ones, almost the basal half of the tibiae and their apices, first four joints of anterior four tarsi and the hind ones beneath, yellowish; last joint of front tarsi, disc of their basitarsi and last two joints of the middle ones, brownish; middle joints of hind tarsi rarely yellowish. Broad bases of hind femora yellowish.

Wings cinerous hyaline; stigma yellow. First posterior cell a little rounded postero-apically; the apical crossvein almost rectangular or slightly bulged; discal crossvein almost rectangular.

Abdomen deep black; somewhat bluish on the disc; fourth segment greenish black, metallic. Second segment with an entire, broad, orange crossband situated a little behind the middle, its anterior margin arched, but often with a broad median emargination and there may be an emargination on the usually transverse posterior margin. Band on the third segment, occupying over the basal half, its posterior border usually straight, but sometimes emitting an incomplete dash forwards, which may be disconnected leaving a longitudinal oval spot. The bands do not reach the lateral margin but are broadly separated from it although the posterior one approaches it more behind. Pile yellow; black on posterior of second, third and base of fourth segments, but the black pile does not reach the lateral margins.

Female: Face usually perpendicular on the upper two-thirds, thence rather suddenly produced, but sometimes not so abruptly; usually mostly shining black, with a narrow median, thinly pollinose stripe which expands a little below and above, but sometimes chiefly pale yellowish or whitish pollinose with an oval shining area on each side which more often connects with the shining cheeks. Front shining, rather polished black, with a rather deep median longitudinal depression which is broadened a little below the middle. Pile black on upper third or fourth.

Pile of thorax shorter. Discal crossvein usually curved outward near its end.

Abdomen with the side margins and terminal segments usually bronzed, sometimes metallic greenish black; rarely with only two spots, on the second segment. Usually the band on the second segment is entire, or sub-interrupted, but frequently interrupted; the band on the third segment may be broadly subinterrupted or interrupted and the spots may be greatly reduced in some cases.

Described from 50 specimens from Banff, Alta., (C. B. D. Garrett), Monroe, Washington; Corvallis, Oregon; Alaska and Colorado.

As suspected by Bigot, *quadrinotata* is a color variety of *nasuta*, but is perhaps entitled to varietal rank as there seem to be slight differences, especially in color of the abdomen, those with the bronzed abdomen being typical *quadrinotata*. This species is readily distinguished from *globosa* by the more black anterior femora, facial profile, etc. As *nasuta* is clearly *metal-*

lica Willist., both Bigot's names must be relegated to the synonymy.

Neoascia globosa Walker.

Ascia globosa Walker, List III, 546.

Neoascia globosa Williston, Syn., p. 111, 1886.

Abdomen with two bands or four spots; front femora yellow on nearly the basal third; face pale yellowish pruinose.

Length, 4 to 5.2 mm. *Male*: Face pale yellowish pruinose, the hairs below confined to just above the lateral oral opening; in profile produced from the upper third or fourth, the lower portion not or scarcely concave, the tip of the oral margin almost as prominent as the tip of the second antennal joint when the antennae are perfect. Front shining greenish black, sometimes brassy in the middle; on the lower part with two or three transverse striae and numerous longitudinal ones above these; pile black, except along the eyes below. Occiput blue black, with yellow pile above, whitish below. Antennae black, third joint reddish below, twice as long as broad.

Thorax shining greenish black, pleura lightly greyish pruinose above; pile pale yellowish; on the disc black; on the pleura white.

Legs whitish yellow; hind femora on the apical two-thirds except the tip, a broad median band on the front four femora; a median band on the front, a broad subapical one on the middle and the hind tibiae except the broad base and apex and superior surface of hind basitarsi black; last two joints of hind tarsi brownish.

Wings lightly fuscous; stigma yellow; apical crossvein slightly curved, its anterior end usually curved towards the base of the wing, the posterior angle of the first posterior cell rounded.

Abdomen deep black, the fourth segment except the base metallic greenish or brassy; on the middle of the second segment with a broad yellow band which may be broadly interrupted in the middle, sinuate in front or entire. The band on the third segment is basal, occupies nearly two-thirds of the segment and may be sub-interrupted, but usually bears an oval spot about its middle. Both bands are broadly separated from the lateral margin. Pile yellowish, not very long; black on the posterior margins of the second and third segments and narrow base of the fourth.

Female: Face with silvery white, less abundant pollen; front without wrinkles, with a deep, broad, longitudinal depression and sometimes a shallow transverse one; pile tawny.

Thorax with more tawny pile on the notum.

First abdominal band always interrupted, the second always sub-interrupted or interrupted and not so wide.

Described from 25 specimens of both sexes, from St. Johns, Que.; Hull, Que.; Ottawa, Ont.; Orillia, Ont.; Toronto, Ont.; Sturgeon Bay, Wis.; Madison, Wis.; Maine and Massachusetts.

This species is quite distinct from others which I have seen and may be readily distinguished by the more extensively yellow legs and rather uniform abdominal spots. It seems to be eastern in distribution. I have not found it commonly in

Ontario, but have taken five or six specimens. *N. albipes* has wholly pale front and middle legs. The ♀ from Maine has unusually dark legs and might be confused with *metallica*; one Massachusetts ♂ is similar, but *metallica* is a mountain form and in cases of doubt locality must bear an important part, but the ♂ of *metallica* never has an interrupted abdominal fascia on the third segment, while *globosa* always has one when the legs are darker than usual.

Neoascia albipes Bigot.

Ascia albipes Bigot, An. Soc. Ent. Fr., 328, 1883,

Neoascia globosa var. *albipes* Williston Syn., 112, 1886.

Allied to *N. globosa* but the front four legs are wholly yellow, the third joint of the antennae is three times as long as wide, the abdomen is adorned with two reddish fascia which may be interrupted or entire, the front is one-fourth the width of the head and the hind femora are slightly larger.

Seven specimens of both sexes from Pennsylvania and New Jersey. Williston recorded it from Connecticut.

This species is so distinct that I do not describe it in detail. *N. globosa* has the front only one-fifth the width of the head, the third antennal joint twice as long as wide and the front legs always with black bands.

**TWO NEW SPECIES OF CENTRAL AMERICAN MELASIDAE
(COLEOPTERA).**

By H. S. BARBER, U. S. Bureau of Entomology.

Two conspicuous species of Central American Melasidae, received for identification, appear to be new and are described below. In the tables of genera of this family by Fleutiaux, 1920, they appear to belong in *Gastraulacus* and *Temnillus* but a perusal of the descriptions in connection with the specimens before me leads to the belief that *G. atratus* Guérin, 1843, is not a synonym of the briefly characterized Brazilian species *G. bisulcatus* Latr., 1834, and that other species may also have been confused under the name of the latter.

The remarkable metasternal and abdominal grooves for the reception of the middle and hind tarsi attracted the attention of Latrielle whose incomplete notes were published after his death and established the Brazilian species as *Galba bisulcatus*. Nine years later this species was chosen as type of a new genus, *Gastraulacus* Guérin-Ménéville, 1843, including also two new species. Bonvouloir, 1870, suppressed the first of these latter, *atratus*, as a synonym of *bisulcatus* and made the second, *lepriouri*, the type of a new genus, *Temnillus*, chiefly because the

eye is divided by a lateral production of the supraantennal carina. This synonymy has remained unquestioned since that time.

Dichotomous distinctions can not be taken from the published descriptions, but such characters as are available are included in the following table as perhaps of more use than detached comments.

Key to Species of Gastraulacus and Temnillus.

1. Eye without dividing carina; propleurae with deep triangular impression
(*Gastraulacus*).....2.
- Eye divided by nearly complete canthus; propleurae not impressed. (*Temnillus*).....6.
2. Metasternal sulci not convergent posteriorly.....3.
- Metasternal sulci convergent posteriorly, extending from outer front angles
of metasternum to near the middle of the posterior margin.....5.
3. Third antennal joint more than twice as long as second; last joint very
short, strongly transverse and internally produced at apex. Head with
two strong impressions in front. Pronotum with slight median impres-
sion at base. Length, 9 mm., Mexico and Columbia.....*atratus* Guérin.
- Third antennal joint shorter.....4.
4. Second and third antennal joints almost equal, cylindrical. Last joint
notably larger than the preceding, thick and almost transversely square
with the extremity rounded. Length about 12 mm. Brazil.....
bisulcatus Latreille.

Antennal joint 2 wider and longer than 3d; 3 to 10 strongly transverse, together only twice as long as thickened part of joint 1, the last joint subtriangularly rounded and about twice as long as 10th. Upper surface coarsely punctate with erect pubescence, subtuberculate, opaque between the shining tubercles. Front with deep impression between antennal sockets extending faintly to vertex. Pronotum with faint basal impression, an obsolescent impression at middle, and a pair of nontuberculate impressions half way between the latter and the sides and a strong fovea near the hind angles. Scutellum subquadrate, the hind angles and margin rounded. Elytral striae represented by irregular series of coarse abrupt shining foveae becoming very coarse apically in the sutural and marginal series. Side margins of last three abdominal segments not covered by elytra and conspicuous from above. Underside shining, with coarse punctures each enclosing a prostrate hair; the last sternite with two vaguely limited basal impressions expanding posteriorly into larger impunctate areas, a pair of deep foveae at apical fourth, apex broadly rounded. Length, 9.8 mm. Width, 3.4 mm. Costa Rica.....

Gastraulacus nevermanni, new species.

5. Subopaque, granulate; head deeply impressed from occiput to base of
clypeus; pronotal median impression extending from near base to
anterior fourth, sharp posteriorly, broader anteriorly; elytral interstices
feebly convex, transversely wrinkled. Length, 13.5 mm. Chontales,
Nicaragua.....*cavifrons* Horn.

6. Form more robust, shining, densely punctured and shagreened; head flattened anteriorly with (front?) slightly excavated; pronotum with feeble posterior and median trace of longitudinal fossa. Scutellum square with posterior margin rounded; elytral intervals punctate and shagreened. Under surface strongly punctured. Length, 7 mm. Width, 3 mm. Cayenne *Temnillus leprieuri* Guérin.

Form more elongate, opaque, finely, densely accutely punctate, with microscopic hairs. Occiput broadly impressed at middle, the impression joining a deep chevron-shaped impression between antennal sockets. Clypeal margin produced into a narrow but well developed median lobe. Basal antennal joint longer than joints 2-6 combined, the 2d one-half as long as 3d, 4th to 10th slightly shorter than 3d and slightly transverse, 11th subquadrate with lower apical angle produced. Pronotum with feeble median impression extending from near base to apical fourth; disc slightly gibbous on each side. Scutellum slightly wider than long, sides straight and convergent posteriorly, becoming evenly rounded. Elytra distinctly sulcate, the striae confluent punctate, deeper behind, intervals hardly convex. Underside feebly shining, densely punctate, prosternum abruptly truncate behind, the last sternite with minute vestiges of the tarsal grooves at base and with strong impressions on each side near apex, leaving a median ridge which meets the underside of the strongly produced pygidium. Length, 11.5 mm. Width, 4.1 mm. Chiapas, Mex. *Temnillus mexicanus*, new species.

The four specimens of *Gastraulacus nevermanni* before me are from a series cut from their cells in the dead part of a standing tree in the forest at Santa Clara, 250 meters altitude, north of the Colombiana Farm and 10 km. west of Siquirres, on the Atlantic Slope, Costa Rica, Apr. 13, 1924, by Ferdinand Nevermann, in whose honor the name has been given.

Type and paratypes.—Cat. no. 27857, U. S. N. M.

The unique specimen of *Temnillus mexicanus* was collected at an altitude of 800-1,000 meters on the Pacific Slope of the Cordilleras in Chiapas, Mexico, in 1919, by L. Hotzen.

Type.—Cat. no. 27858, U. S. National Museum.

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 1843 GUÉRIN-MÉNEVILLE.—Ann. Soc. Ent. Fr. (2) vol. 1, p. 188, pl. 6, figs. 50-54.
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 1870 BONVULOIR.—Ann. Soc. Ent. Fr. (4) vol. 10. Supplement, Monogr. Eucnemides, pp. 112-117. pl. 3, fig. 2 and pl. 5, figs. 4-5.
 1890 HORN.—Biol. Centr. Amer. Coleop. vol. 3, pt. 1, p. 215, pl. 10, fig. 9.
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PAUL REVERE MYERS.

PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

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In Memoriam

The following resolutions were adopted by the Entomological Society of Washington on March 11, 1925.

Whereas the Entomological Society of Washington has lost by death one of its most beloved members, Paul Revere Myers, and

Whereas Mr. Myers was a member of long standing in the Society and had by his contributions to its proceedings and participation in its affairs added to the interest of its meetings and the importance of its publications, and

Whereas his sunny disposition, friendly personality, and sterling worth of character had endeared him to all of the members of the Society, therefore

Be it resolved that in the untimely death of Mr. Myers the Society has suffered a grievous loss; that the field of systematic entomology has been deprived of one of its most promising young workers in a branch that can ill afford such deprivation, and

Be it further resolved that the members of the Society who loved and admired him will always be inspired by the memory of his devotion to Science, his willingness to aid others, and his indefatigable zeal in the performance of duty.

Be it further resolved that a sketch of Mr. Myers' life (including bibliography) be prepared for publication in the Proceedings of the Society, and that copies of these resolutions be sent, with an expression of deep and sincere sympathy, to his family.

PAUL REVERE MYERS

BY W. R. WALTON, A. B. GAHAN AND J. A. HYSLOP.

The many friends of Mr. P. R. Myers, in charge of the Hessian Fly Laboratory of the Federal Bureau of Entomology at Carlisle, Pennsylvania, will be deeply grieved to learn of his death which occurred at 12:30 P. M. on February 12 last. Mr. Myers was seized with septic pneumonia on February 5, and although he had the benefit of all that medical science could offer, its aid did not avail and he failed to rally.

Paul Revere Myers was born at Harrisburg, Pennsylvania, February 15, 1888, and received his basic education in the public schools of that city. Mr. Myers took a keen and active interest in natural history even in his extreme youth, and when but 19 years of age was appointed as an assistant in the Pennsylvania Bureau of Economic Zoology at Harrisburg. Here he was associated with a group of enthusiastic young entomologists and zoologists, most of whom have since become well known either in applied or research entomology. A flood of miscellaneous zoological material constantly passed through the laboratory in which Mr. Myers was employed, including specimens of the Pennsylvania fauna ranging from the arthropods to the mammals. The identification and anatomical examination of this abundant material, together with his work in entomology, entailed a greater variety and amount of real zoological work than is to be had in the ordinary natural science courses of many of our colleges. Mr. Myers was engaged principally during this time in the rearing of insects under laboratory conditions, and after about two years of such service was appointed, on March 1, 1910, as Aid in the Division of Insects of the U. S. National Museum. The four years spent by Mr. Myers in this position had a profound effect in directing the course of his future in entomological work. His association there with the keen and highly trained taxonomists of the Bureau of Entomology stimulated his interest and influenced him to begin a serious study of the Hymenoptera, in which effort he was most generously aided by several members of the staff. During this time Mr. Myers aided importantly in the arrangement of the very large and constantly growing collection of Hymenoptera, while his naturally keen powers of observation soon permitted him to develop a good working knowledge of the order as a whole. After a time, the parasitic forms began to have an absorbing attraction for him, and at the end of his term of service in the Museum he determined to devote his whole attention to this group. With this end in view he secured through the late F. M. Webster on August 27, 1914, a transfer to the Bureau of Entomology, and was assigned to the study of the parasites of the Hessian fly under the late W. R. McConnell,

at Hagerstown, Maryland. At that time a comprehensive study of this parasitic complex had but recently started, hence Mr. Myers was able to enter this work at an opportune moment. Under the competent guidance of Mr. McConnell, who was a broadly trained zoologist as well as a research worker of marked acumen, Mr. Myers quickly developed into a parasitologist of most promising ability. So competent had he become, indeed, that upon the death of Mr. McConnell in June of 1920 Mr. Myers was placed in charge of the station which he had conducted with increasingly excellent results for nearly five years.

The dominant note of Mr. Myers' character was kindness to every person with whom he came into contact. Race, color, creed, or condition in life mattered naught to him. His sympathetic nature led him to take a really personal interest in every one he met. He constantly shed the light of cheerfulness as he passed, and had reduced the theory of the "brotherhood of man" to everyday practice.

Mr. Myers published several important papers dealing with the biology and taxonomy of the Hymenopterous parasites of the Hessian Fly and at the time of his death had but just completed a large manuscript entitled "A Synopsis of Hymenopterous Parasites Reared from the Hessian fly in the United States," which contains a key for the determination of the species, numerous illustrations, and much information of great value to entomologists engaged in the investigation of the Hessian Fly and to students of the Hymenoptera in general. Mr. Myers was a member of the American Association of Economic Entomologists, Entomological Society of Washington, Pennsylvania Academy of Science, and Entomological Society of America. He was married in Washington, D. C., April 19, 1911. His wife and two children, Kathryn, aged 12, and Paul, aged 3, survive at 556 West Louthier Street, Carlisle, Pennsylvania.

Mr. Myers' entomological publications are as follows:

- 1915 Results of the Yale-Peruvian Expedition of 1911. Addendum to the Hymenoptera Ichneumonides. Proc. U. S. Nat. Mus., v. 47, pp. 361-362. No. 2052.
- 1917 A New Parasite of the Hessian Fly (*Mayetiola destructor* Say). Proc. U. S. Nat. Mus., v. 53, pp. 255-257. No. 2204.
- 1917 An American Species of the Hymenopterous Genus *Wesmaelia* of Foerster. Proc. U. S. Nat. Mus., v. 53, pp. 293-294. No. 2206.
- 1921 Observations Relative to Recent Recoveries of *Pleurotropis epigonus*, with J. S. Wade. Proc. Ent. Soc. Wash., v. 23, No. 9, pp. 202-206.
- 1924 *Polyscelis modestus* Gahan, a Minor Parasite of the Hessian Fly. Jour. Agr. Res. v. 29, p. 289-296.
- 1924 The Identity of *Nemicromelus fulvipes* Forbes, a common Hessian fly Parasite. (In press.)
- A Synopsis of Hymenopterous Parasites Reared from the Hessian fly in the United States. (To be published.)

A PHYLOGENETIC STUDY OF THE LABIUM OF HOLOMETABOLOUS INSECTS, WITH PARTICULAR REFERENCE TO THE DIPTERA.

BY G. C. CRAMPTON.¹

In the May, 1924, issue of these "Proceedings" Dr. A. D. MacGillivray criticises the views proposed by me in two previous papers (Crampton, 1921, and 1923), dealing with the labial structures of the Holometabola and the Diptera in particular. It is greatly to be regretted that Dr. MacGillivray's untimely death, which has dealt a heavy blow to the study of insect morphology in this country, has deprived his side of the argument of his able support; and it might perhaps be considered unfair to continue the discussion under these conditions. On the other hand it is commonly believed that "*qui tacet consentit*," and least by remaining silent, I should appear to admit that Dr. MacGillivray is justified in maintaining that my interpretations are erroneous, and that I have mistaken analogy for homology, as he claims, I would present herewith additional proof of the correctness of my interpretations, which appears to me to be absolutely incontestable and conclusive.

One of Dr. MacGillivray's criticisms is that I did not use the most primitive representatives of each order of the Holometabola to illustrate the evolutionary tendencies resulting in the production of the Dipterous type of labium. Due to their extreme rarity and great value, it is usually impossible to obtain for dissection the most primitive representatives of the different orders; but through the generous aid of Drs. J. W. Campbell and C. P. Alexander, and Mr. T. R. Harris, I have been able to make a study of *Tanyderus* (Fig. 3), which is generally admitted by Dipterists to be the most primitive living representative of the order Diptera; and Dr. R. J. Tillyard has very kindly given me specimens of *Chorista* (Fig. 18), which is considered to be one of the most primitive of living Mecoptera. Through the generosity of Messrs. S. A. Rowher and Wm. Middleton, I have obtained specimens of *Xyela* (Fig. 32), which is considered to be as primitive as any known Hymenopteron, while Dr. Campbell and Mr. Tapley have generously supplied me with specimens of the archaic Lepidopteran *Sabatinca* (Fig. 15), which I have been able to compare with specimens of *Micropteryx* from Dr. Buxton, and *Mnemonica* from Dr. Busck. Dr. A. B. Champlain has very kindly given me specimens of the Coleopteran *Cupes* (Fig. 31); and since it is comparatively easy to obtain such primitive Coleoptera and Neuroptera as the Lampyridae, *Sialis*, *Corydalid*, etc., I have been able to

¹Contribution from the Entomological Laboratory of the Massachusetts Agricultural College, Amherst, Mass.

meet Dr. MacGillivray's demands even in this difficult matter; and I would emphasize the fact that these primitive insects prove even more conclusively than do the forms I used before, the correctness of the views set forth in my former paper—and if Dr. MacGillivray could have studied these primitive insects, I feel confident that he would have been convinced by the unmistakable evidence they offer in support of the correctness of the conclusions set forth in my former papers!

Since Dr. MacGillivray's criticism was directed chiefly against my interpretation of the parts of the Dipterous labium, I have devoted the greater portion of the following reply to the discussion of the homologies of the labial structures of the Diptera. The most primitive representative of these insects, as was mentioned above, is *Tanyderus*. When the labium of this primitive Dipteran (Fig. 3) is compared with the labium of the Mecopteran shown in Fig. 2 (which is quite as primitive as the labium of the archaic Mecopteran shown in Fig. 18), the striking correspondence, even to the minutest details, is most astonishing, especially when we take into consideration the fact that the two insects in question belong to different groups of ordinal rank! Thus, the elongated mentum *mn* of the Dipteran shown in Fig. 3 corresponds in every way to the elongated mentum *mn* of the Mecopteran shown in Fig. 2. The palpigers *pgr* of the Dipteran shown in Fig. 3 are distinct distally, but unite basally, just as is the case with the palpigers *pgr* of the Mecopteran shown in Fig. 2. There are traces of two segments in the labial palpi *lp* of the Dipteran shown in Fig. 3, and there are but two segments in the labial palpi of the Mecopteran shown in Fig. 2. The two-segmented condition of the labial palpi of the Diptera, however, is better illustrated by the labial palpi *lp* of the Diptera shown in Figs. 7 and 4—but the correspondence in other details is not so marked as when the parts of the Dipteran shown in Fig. 3 are compared with those of the Mecopteran shown in Fig. 2. In fact, the only structure found in Fig. 3 which does not occur in Fig. 2 is the median structure *lg* situated between the labial palpi *lp* of Fig. 3. A comparison of the parts of Fig. 3 with Fig. 6 would indicate that the structure labelled *lg* in Fig. 3 is the ligula *lg* of Fig. 6, since the ligula *lg* is located between the labial palpi *lp* and is distal to the palpigers *pgr* in both insects. Now, the ligula *lg* of Fig. 6 (and consequently the ligula *lg* of Fig. 3) corresponds to the ligula *lg* of the other Coleopteran shown in Fig. 29, which is composed of the *paraglossae*, as is shown by comparing the latter with the ligula *lg* of the labium of such Coleoptera as the one shown in Fig. 10, which MacGillivray admits is composed of the united *paraglossae* and *glossae*. The *paraglossae* thus compose the ligula *lg* of Fig. 10, and of Fig. 29; and consequently the *paraglossae* compose the ligula *lg* of Fig. 6, and also

the ligula *lg* of the Dipteran shown in Fig. 3, which is homologous with the ligula *lg* of Fig. 6. It is thus quite clear that if the paraglossae are contained in the ligula *lg* of the Dipteran shown in Fig. 3, the paraglossae can not possibly be represented by the labial palpi *lp* of the Dipteran shown in Fig. 3, as MacGillivray claims, is the case in the Diptera!

I do not understand how any one could compare the series of insects shown in Figs. 1, 2, and 3, without coming to the inevitable conclusion that the elongated mentum *mn* is the same in all, that the palpigers *pgr* are the same in all, and that the labial palpi *lp* are the same in all. Dr. MacGillivray, however, thinks that I have been deceived by a false analogy, and that the obvious similarity is but a trap to ensnare the unwary! Strange to say, he considers that the tiny median structure *lg* of the Dipteran shown in Fig. 4 (which is homologous with the median structure *lg* of the Dipteran shown in Fig. 3) represents the ligula *lg* of the Neuropteran shown in Fig. 1, without realizing that this admission in itself precludes the possibility of regarding the labial palpi *lp* of Fig. 4 as "paraglossae"; for the paraglossae must be included in the median structure *lg* of Fig. 4 (and Fig. 3) if this structure is homologous with the ligula of Fig. 1, since a comparison of the Neuropteran shown in Fig. 1 (which is the same as the one shown in Fig. 25) with other Neuroptera such as those shown in Fig. 24 and Fig. 23, clearly shows that the ligula *lg* of Fig. 25 or Fig. 1, represents the paraglossae *pgl* of the ligulae *lg* of the Neuroptera shown in Figs. 24 and 23. The palpigers *pgr* of the three Neuroptera in question merely become approximated mesally and bring the bases of the palpi closer together as one runs through the series, and the result of this approximation of the palpigers and palpi, is to crowd the ligula *lg* (composed of the paraglossae) forward out of position; and this tendency for the palpigers (with their palpi) to become approximated mesally and crowd out the ligula (composed of the paraglossae), is exhibited in all of the Holometabola (compare the Coleopterous series shown in Figs. 27, 28 and 29, or the Hymenopterous series shown in Figs. 32, 33 and 34, and note the approximation of the bases of the palpigers *pgr* of the Lepidopteran and Trichopteran shown in Figs. 15 and 14). It is therefore merely to be expected that the same thing will occur in the Diptera also, since it occurs in all of their relatives, so that it is surely a reasonable assumption that in the Diptera shown in Figs. 3 and 4, the ligula *lg* (composed of the paraglossae as in all other Holometabola) is crowded out of position by the approximation of the palpigers *pgr* and labial palpi *lp*.

Dr. MacGillivray, while admitting that the median structure *lg* of the Dipteran shown in Fig. 4 (or Fig. 3) is the ligula, claims that this ligula, unlike that of any other Holometabola, is com-

posed of the united glossae alone, and that the Diptera, unlike any other Holometabola, or any other known insect for that matter, have retained a pair of enormously developed paraglossae, while their labial palpi disappear completely! One should be wary of postulates which assume a condition not known to occur in any other insect whatsoever, and in this case, one's doubts are amply justified!

Dr. MacGillivray seeks to strengthen his argument that the labella of the Diptera represent paraglossae rather than modified labial palpi, by citing the work of his student, Dr. Peterson, who, according to Dr. MacGillivray, "has simply followed Kellogg and a host of other workers" in interpreting the labella as paraglossae. Who this "host of other workers" may be, I do not know. Frey, 1921, cites Savigny, 1816, Menzbier, 1830, Newport, 1839, Bugnion and Goeldi, 1913 (Lang's "Handbuch"), and Peterson, 1916, as the defenders of the view that the labella represent paraglossae, while Brullé, 1844, regards them as glossae, and Wesche regards them as representing both glossae and paraglossae combined.

Dr. MacGillivray implies that his views are the same as those "of all modern writers, except Drs. Crampton and Tillyard, who have studied the labium of the Diptera"; but he is apparently unaware of the fact that many Continental Dipterists, such as Drs. Frey, Gruenberg, and others, regard the labella of Diptera as modified labial palpi, and Frey, 1921, cites among others, as favoring this view, the works of Burmeister, 1832, Erichson, 1840, Becher, 1882, Kraepelin, 1884, Gruenberg, 1907, and Frey, 1913. Furthermore, all of the modern American Dipterists whom I have questioned in the matter, such as Drs. J. M. Aldrich, C. P. Alexander, and others whose intensive studies of the Diptera have qualified them to express an opinion on the subject, have expressed their unqualified approval of the interpretation of the labella of Diptera as modified labial palpi, so that Dr. MacGillivray is greatly mistaken in thinking that Dr. Tillyard and I are the only recent investigators who regard the labella as modified labial palpi. The correctness of any view, however, is not determined by the number of its adherents, and the "*petitio ad auctoritatem*" can never carry more weight than a direct appeal to the evidence offered by the structures themselves, in the mind of any one imbued with the modern spirit of research. I would therefore rest my case upon the evidence obtained from the actual study of the insects themselves, and I would cite the following facts as offering conclusive proof that the labella of the Diptera are not paraglossae, but are modified labial palpi.

In the Dipteran shown in Fig. 7, the labial palpi *lp* are distinctly two-segmented, and the same is true of the Dipteran shown in Fig. 4. In no Holometabolous insects whatsoever are

the paraglossae ever two-segmented. The structures in question in the Diptera must therefore be modified labial palpi, rather than paraglossae.

In the Dipteran shown in Fig. 12 the structures labelled *lp* must be labial palpi because they are borne on the distal ends of the palpigers *pgr*. Neither paraglossae nor any other labial structures (save the palpi alone) of any insects whatsoever are ever borne on the distal ends of the palpigers. The labial palpi *lp* of the Diptera shown in Figs. 12, 7, 20, etc., must therefore be labial palpi and nothing else.

Dr. MacGillivray apparently realized that it would be fatal to his argument to interpret the structures labelled *pgr* as the palpigers in the Dipteran shown in Fig. 12, and he consequently interprets them as labial stipites instead. The muscles labelled *mus* in the Dipteran shown in Fig. 12, however, are exactly homologous with similar muscles extending from the palpigers to the region of the gular pits, or posterior tentorial invaginations, in such insects as *Corydalis* (see Crampton, 1921), etc., and since these same muscles, which extend from the posterior tentorial invaginations to the palpigers, are attached to the structures labelled *pgr* in the Dipteran shown in Fig. 12, the structures labelled *pgr* can be nothing else than the palpigers—and the structures labelled *lp* which they bear at their distal ends, must be the labial palpi.

Dr. MacGillivray stoutly defends his student, Otones, in maintaining that the structures labelled *pgr* in the Mecopteran shown in Fig. 13 are not the palpigers either; but if one studies carefully the series of insects shown in Figs. 10, 11, 12 and 13, the correctness of the homologies there indicated will be at once apparent. Let us start, for example, with the insect shown in Fig. 10, in which the interpretation of the parts are essentially the same as the interpretation given for this insect by Dr. MacGillivray, since it is only by starting at some point upon which we all agree, that we can have any common basis for argument.

Dr. MacGillivray admits that the structures labelled *pgr* in Fig. 10 are the palpigers which bear at their distal ends the labial palpi *lp*. The median region *ls* he regards as the united labial stipites, and he interprets the lateral membranous lobes *pgl* of the ligula *lg*, as the paraglossae. In all of these interpretations I would agree with Dr. MacGillivray.

In the insect shown in Fig. 10 there is a marked tendency for the palpigers *pgr* (which bear the labial palpi *lp* at their distal ends after the fashion of the palpigers of all insects without exception) to become approximated mesally, and to crowd forward (or dorsalward) out of position the labial stipites *ls* and ligula *lg*, upon which the approximated palpigers *pgr* now come to lie. A further stage of evolutionary modification is

illustrated by another Coleopteran shown in Fig. 11, in which the ligula *lg* of Fig. 10 (composed of the paraglossae *pgl*) becomes reduced to the tiny vestige labelled *lg* in Fig. 11, while the palpigers *pgr*, which become approximated over the median labial stipites *ls* and ligula *lg* (composed of the paraglossae *pgl*) in Fig. 10, now become closely applied to each other mesally to form the palpigers *pgr* of Fig. 11. These palpigers *pgr* in Fig. 11 unite so closely that they are separated only by a median suture, while the labial stipites region *ls* of Fig. 10, which is situated at the base of the ligula *lg* in Fig. 10, now becomes so crowded out and reduced that there are scarcely any traces of it retained on the anterior (dorsal) surface, while no traces of it are visible on the posterior (ventral) surface; and only the tip of the disappearing ligula *lg* (composed of the paraglossae) is to be seen between the bases of the labial palpi *lp*, which are borne, as usual, at the distal ends of the palpigers *pgr*. A few strands of what appeared to be vestigial muscle threads *mus* remained attached to the bases of the palpigers *pgr* in the specimen shown in Fig. 11, but the labium is so greatly reduced in *Calopteron*, that the muscle, also, has practically or wholly disappeared in normal specimens.

It is a simple matter to compare the parts of Fig. 12 with those of Fig. 11, since the palpigers *pgr* of Fig. 12 bear the palpi *lp* at their distal ends, as in Fig. 11, and the tiny ligula *lg* of Fig. 12 (which is hardly visible from this aspect of the labium) composed of the paraglossae, as in Fig. 11 (or Fig. 10), is even more reduced in size than is the vestigial ligula *lg* of Fig. 11. It is but a step from the condition exhibited in Fig. 12 to that exhibited by the insect shown in Fig. 13, since in the latter insect the ligula *lg*, which was already "on the road to extinction" in Figs. 12 and 11, now becomes completely lost in Fig. 13. The labial palpi *lp* of Fig. 13 are borne at the distal ends of the palpigers *pgr* in the usual fashion, in Fig. 13, and to the proximal or basal ends of these palpigers *pgr* of Fig. 13 are attached the typical palpigeral tendons *pgt*, which correspond to the palpigeral tendons *pgt* attached to the bases of the palpigers *pgr* of the insect shown in Fig. 10 and these tendons serve as points of attachment for muscles extending to the gular region in both insects. It is thus perfectly clear that the palpigers *pgr* of Fig. 13 are the palpigers *pgr* of Fig. 12, and these in turn are the palpigers *pgr* of Figs. 11 and 10; while the labial palpi *lp* are borne on the distal ends of the palpigers *pgr* in the fashion typical of all insects, in all of the forms shown in the series traced from the insect shown in Fig. 13 back to Fig. 10, from which we started.

A study of the structural details of the insects shown in the series illustrated by Figs. 10, 11, 12 and 13, would thus completely confirm the conclusions as to the interpretation of the

parts in the series from Fig. 1 to Figs. 3 and 4. A further comparison of such Diptera as the one shown in Fig. 20 with such Mecoptera as the ones shown in Figs. 19 and 18 would indicate that while in some Diptera and Mecoptera the mentum *mn* is greatly elongated as in Figs. 3 and 2, in other Diptera and Mecoptera such as those shown in Figs. 20 and 19, the mentum *mn* is not elongated, but in both of the latter types the mentum *mn* has remained rather short and has retained the median process labelled *mm* in Figs. 20 and 19. It is thus quite evident that the same evolutionary tendencies occur in both Diptera and Mecoptera, and we are absolutely justified in assuming that the labial palpi *lp* of the Dipteran shown in Fig. 20 represent the labial palpi *lp* of the Mecopteran shown in Fig. 19, while the palpigers *pgr* of Fig. 20 represent the palpigers *pgr* of Fig. 19, and the mentum *mn* is practically the same in both. The correspondence even to the minutest details is thus most striking when we compare Figs 20 and 19, while the correspondence in the minutest details is equally apparent in the series of insects shown in Figs. 10 to 13, and the same close resemblance, part for part, is likewise exhibited in the series of insects shown in Figs. 1, 2 and 3. Dr. MacGillivray is therefore wholly unjustified in accusing me of confusing mere superficial resemblance, or analogy, with true homology, which is based upon fundamental resemblances in structural details, resulting from consanguinity, when he says that I have so confused analogy and homology in comparing the parts of the Dipterous labium with those of the Mecopterous labium in series 1 to 3, for example. There is no mere superficial resemblance here, and it is unfortunate that Dr. MacGillivray did not extend his studies to include all of the available facts, in attempting to determine this matter.

Every student of phylogeny is keenly alive to the importance of studying the tendencies exhibited by the nearest ancestral types, in attempting to determine the modificational tendencies exhibited by a group higher in the scale of evolution. It is therefore imperative that we study the condition exhibited by the Mecoptera (which are admitted by all to be the nearest living representatives of the types ancestral to the Diptera) in attempting to determine the correct interpretation of the parts of the Dipterous labium, and such a study of the Mecoptera indicates in no uncertain manner, that the two-segmented labial palpi, approximated palpigers, and a mentum, are what we would expect to find in the Diptera. There is no indication whatsoever in the Mecoptera (which are like the ancestors of the Diptera) that the paraglossae are ever retained at all—much less that they shall become enormously developed, nor is there any indication in the Mecoptera that the labial palpi shall completely disappear. In fact, the distal segments of the

labial palpi of certain Mecoptera, such as the one shown in Fig. 22, may even become membranous, labella-like lobes exactly like the labella of the Diptera, thus indicating unmistakably the tendencies which later find opportunity for further development in the Dipterous labium. Dr. Tillyard informs me that the labial palpi of some Mecoptera actually exhibit pseudotracheae similar to the pseudotracheae occurring on the labella of certain Diptera, and it is absurd to brush aside as of no value such important features in the labium of the Mecoptera, which are of the utmost importance for a correct understanding of the modifications undergone by the Dipterous labium.

Not only should we study the Mecoptera, in attempting to reach a correct decision as to the meaning of the parts of the labium of the Diptera, but it is also necessary to study the modificational tendencies exhibited by other Holometabola closely related to the Diptera. The closest relatives of the Diptera, other than the Mecoptera, are the fleas, Trichoptera and Lepidoptera, and in all of these orders (as in the Mecoptera also) the ligula, composed of the paraglossae, is completely lost, while the palpigers, bearing the labial palpi, become mesally approximated and compose the distal portions of the labium. It is thus but natural to expect that the Diptera shall exhibit the same evolutionary tendencies which are manifested by *all of their relatives*, and such a supposition inevitably leads to the conclusion that the labial palpi, palpigers and mentum are the structures which make up the Dipterous labium.

Thus, in the Trichopteran shown in Fig. 14, the ligula, composed of the paraglossae has completely disappeared (the median structures labelled *hph* in Fig. 14 is the hypopharynx, as is indicated by the opening of the salivary duct at its base) while the palpigers *pgr*, which bear the labial palpi *lp*, become approximated mesally and the mentum *mn* has a median prolongation *mm* similar to that of the mentum of the Dipteran shown in Fig. 20. It is therefore not the paraglossae which are retained in the Trichoptera, but rather the labial palpi, and the inference is that the same occurs in the related Diptera.

Similarly, in the Lepidopteran shown in Fig. 15, the ligula, composed of the paraglossae, is lost (the median structure *hph* is the hypopharynx, as in the Trichopteran shown in Fig. 14), while the palpigers *pgr* become approximated mesally, and bear the two-segmented labial palpi just as in the Diptera, although the palpigers *pgr* of the Lepidopteran shown in Fig. 15 bear a pair of lobes labelled *lo*, which are not present in the Diptera here figured. It is therefore not the paraglossae which are retained in the Lepidoptera, but rather the labial palpi, and the inference is that the same occurs in the related Diptera.

The Lepidopteran shown in Fig. 15 is remarkably similar to the Trichopteran shown in Fig. 14, and the labium is thus in

line with other structures indicating an extremely close relationship between the Lepidoptera and Trichoptera. The labium of the Trichopteran shown in Fig. 14 is more primitive than that of the Lepidopteran shown in Fig. 15 in that the labial palpi *lp* of the Trichopteran are three-segmented, while the palpi of the Lepidopteran are reduced to two segments. There is a well developed submentum *sm* in *Sabatinca* (Fig. 15) as in *Micropteryx* and related genera.

In the fleas (Fig. 8), which are very closely related to the Diptera, and are thought to be descended from the Diptera by some investigators, the ligula is apparently completely lost, as in other higher Holometabola, and the labial palpi *lp* (Fig. 8) become approximated to form the terminal portion of the labium. The greater portion of the labium of the fleas is made up of the labial palpi *lp*, the palpigers *pgr*, and the mentum *mn*, as in the Diptera and other higher Holometabola, although a distinct submentum *sm* is retained in the flea shown in Fig. 8.

It is surely worthy of consideration, in determining the homologies of the parts of the Dipterous labium, that in *all* of the higher Holometabola (i. e. the Mecoptera, Siphonaptera, Trichoptera, and Lepidoptera) *the paraglossae are always lost*, while the labial palpi are always retained, being approximated to form the terminal portion of the labium in all higher Holometabola; and it is folly to disregard the tendencies exhibited by all of the related groups of insects, and by the "ancestral" group of the Mecoptera as well, in attempting to determine the correct interpretation of the parts of the labium in the Diptera! We simply can not ignore these important facts, and when the evidence from this source is in full accord with that gained from a detailed comparison of the parts of the Dipterous labium with those of related forms, it is quite apparent that the view that the labella of Diptera represent the modified labial palpi is the only one worthy of consideration, since it is the only one for which any actual proof has been adduced, and is the only one in harmony with all of the known facts.

It may be remarked in this connection that it is not merely in the higher Holometabola alone (i. e. the Siphonaptera, Diptera, Mecoptera, Trichoptera and Lepidoptera) that the ligula becomes atrophied and the labial palpi become approximated to form the terminal portion of the labium, for similar tendencies are exhibited in all of the Holometabolous orders (with the exception of the Strepsiptera, in which the labium is practically entirely lost). Thus in the Coleopterous series represented by Figs. 27, 28 and 29, there is apparent a tendency for the palpigers *pgr* to become approximated, and for the ligula *lg* to become reduced—a process which is carried still further in the Coleopteran shown in Figs. 11 or 21, and in the Coleopteran shown in Fig. 16 the ligula is apparently completely lost. Simi-

larly, in the Hymenopterous series represented by Figs. 32, 33 and 34, there is evidently a tendency for the palpigers *pgr* to become approximated mesally, while the ligula, or glossae and paraglossae, become crowded out of position and are pushed forward in a peculiar fashion. So too, in the Neuropterous series shown in Figs. 23, 24 and 25, it is clearly apparent that there is a well marked tendency for the palpigers *pgr* with the palpi *lp* to become approximated mesally, and to crowd out the ligula *lg* which is again pushed forward out of the way, and this well marked tendency for the palpigers to become approximated mesally and to crowd the ligula out of place in these lower Holometabola, clearly paves the way for the further development of similar tendencies in the higher Holometabola, in which there is not only a tendency for the palpigers to become approximated mesally, but the crowded-out ligula seems to disappear completely in the higher Holometabola, with the possible exception of the Diptera in which the ligula practically disappears, being scarcely visible in most Diptera. In fact, I do not really believe that the so-called ligula of the Diptera represents the retention of a true ligula, since I consider that it is a new formation composed of the union of two small lobes of the palpi, such as those shown in Fig. 5; but since the tendency among recent investigators is to regard the median structure between the labial palpi of Diptera as a true ligula, I have provisionally followed this usage in the present paper.

The greater portion of the foregoing discussion has been devoted to the establishing of the homologies of the palpigers and labial palpi in the Diptera and related forms, since the settling of this question is the most important feature in determining the homologies of the parts of the Dipterous labium, and I trust that I have made it clear that the labial palpi and palpigers can not possibly be regarded as the paraglossae and labial stipites, as is claimed by Dr. MacGillivray, nor can the palpigers (which are called the "theca" by Peterson, 1916), be regarded as part of the mentum, as Frey, 1921, apparently thinks is the case. There is a true mentum labelled *mn* in the Dipteran shown in Fig. 20, and this mentum corresponds in every way with the mentum *mn* of the Mecopteran shown in Fig. 19. The mentum *mn* of both Figs. 20 and 19 bears the typical median process labelled *mm* in these figures, and this process is just like the median process *mm* borne on the mentum of the Trichopteran shown in Fig. 14, or of the Lepidopteran shown in Fig. 15, or of the Coleopteran shown in Fig. 16, or of the Hymenopteran shown in Fig. 33, etc., and this median process, which extends up between the palpigers *pgr* in some cases, is typical of the mentum of many insects and is of value in identifying the mentum.

Dr. MacGillivray would interpret the mentum *mn* of such a Mecopteran as the one shown in Fig. 19, as the "submentum," instead of regarding it as the mentum. In the Mecopteran shown in Fig. 22, however, there is a distinct submentum and gular region labelled *sm* and *gu* behind the mental region *mn* (the submentum and gula are united and continuous in practically all insects), so that the plate *mn* of the Mecoptera shown in Figs. 22, 19, etc., can hardly represent the submentum. In fact, the submentum is never located immediately basal to the palpigers, for the mentum *mn* always occupies this position when both mentum and submentum are present as in Fig. 16 (or Fig. 21), and the submentum never has a median process *mm* extending forward to the palpigers *pgr* as is the case with the plate labelled *mn* in Figs. 20, 19, 14, 15, 16, 17, 33, etc., which is therefore the mentum in all of these figures.

The submentum *sm* is fairly large in the primitive Hymenopteran shown in Fig. 32, and the mentum *mn* is not proportionately very large in this insect.¹ In the Hymenopteran shown in Fig. 33, however, the mentum *mn* increases in length, while the submentum *sm* becomes more elongated and proportionately smaller and the process is repeated until in such Hymenoptera as the one shown in Fig. 34, the mentum *mn* has become very greatly elongated, and the submentum *sm* has become reduced to the small triangular area shown in Fig. 34.

A similar tendency toward the reduction of the submentum *sm* and the elongation of the mentum *mn* is shown in the series of insects depicted in Figs. 27, 28 and 29. Since Dr. MacGillivray would contest this interpretation of the mentum and submentum in the Coleoptera, I would start with the condition exhibited by the labium of the insect he calls "*Blatta*" (i. e. *Periplaneta*) *orientalis*, shown in Fig. 26, and compare it with the labia of the Coleoptera as he has done. It is necessary, however, to use a more primitive type of Coleopteran for comparison with the Blattid than Dr. MacGillivray used, if the comparison is to be of any value; and when the labium of such a

¹In my figures of the labia of Hymenoptera I have followed the interpretation of MacGillivray, who regards the apparent basal segment of the labial palpi (i. e. the structure labelled *pgr* in Figs. 32 and 34) as the homologue of the palpigers. In his Figure 14 of the labium of the current sawfly, Snodgrass, 1925 ("Anatomy of the Honeybee") interprets as the united palpigers the sclerite I have labelled *mn* in the sawfly shown in Fig. 32, for example, and I think that Snodgrass' interpretation is the more probable one, since I find attached to the plate *mn*, in certain sawflies, muscles similar to those which extend between the palpigers and gular region in other insects. It would therefore appear that the palpigers are included in the region labelled *mn* in Fig. 32, for example, and the segment bearing the label *pgr* is really a segment of the labial palpus in Hymenoptera. It was impossible to change the labelling of the plates, however, since the blocks for these have already been made, and this correction will have to serve, in referring to the parts shown in the Hymenopterous figures.

primitive Coleopteran as that shown in Fig. 27 is compared with the labium of the Blattid shown in Fig. 26, it is at once apparent that the large area labelled *sm* in the Coleopteran shown in Fig. 27 corresponds to the submentum *sm* of the roach shown in Fig. 26, while the chitinized mentum labelled *mn* in Fig. 27 corresponds to the chitinized mentum *mn* of Fig. 26, and the mental membrane *mem* of Fig. 27 corresponds in every way to the mental membrane *mem* of Fig. 26. Distal to the mental membrane *mem* in both insects are the palpigers *pgr* bearing the labial palpi at their distal ends, while the ligula *lg* is situated between and distal to the palpigers in both insects. It is thus a very simple matter to compare all of the parts in both insects, since they correspond in every way, save that the Coleopteran has no glossae, and the roach has no differentiated gular region.

Having determined the homologies of the parts of the labium of the Coleopteran shown in Fig. 27, it is a simple matter to compare its parts with those of the labium of the Coleopteran shown in Fig. 28. Thus, the gular region *gu* of Fig. 27 corresponds to the gular region *gu* of Fig. 28, while the large submentum *sm* of Fig. 27 becomes the reduced submentum *sm* of Fig. 28. The chitinized mentum *mn* and mental membrane *mem* of Fig. 27 become enlarged to form the chitinized mentum *mn* and mental membrane *mem* of Fig. 28. The palpigers *pgr* of Fig. 27 become more elongated in Fig. 28, and the ligula *lg* becomes narrower and more markedly crowded forward in Fig. 28. In the Coleopteran shown in Fig. 29 the processes operative in Fig. 28 become even more marked. The submentum *sm* becomes even more greatly reduced in Fig. 29, while the mentum *mn* becomes proportionately much larger¹ and is more elongated in Fig. 29. The palpigers *pgr* are more closely approximated in Fig. 29, and the ligula *lg* becomes slenderer and more markedly crowded out of place.

Thus in the Coleopteran series shown in Figs. 27, 28 and 29, as in the Hymenopteran series shown in Figs. 32, 33 and 34, the submentum *sm* tends to become reduced to a mere vestige, while the mentum *mn* becomes greatly elongated, ending in the extremes of modifications exhibited by the insects shown in Figs. 29 and 34. These series represent very definite tendencies in the groups in question, and serve to indicate what evolutionary tendencies may be looked for among certain higher Holo-metabola.

¹An examination of a series of Lampyroid and other Coleoptera from South America has convinced me that the elongated region in question is composed chiefly of the mentum; and it is very probable that the slender elongated region labelled *mn* in the insects shown in Figs. 1, 2, 3, etc., is likewise composed chiefly of the mentum. The submentum has either become membranous, or has united with the sclerite bearing the label *mn*, in Figs. 1, 2, 3, etc.

In the Coleopteran shown in Fig. 9, the palpigers *pgr* tend to unite with the greatly elongated mentum *mn*, and in the Dipteran shown in Fig. 4 it would appear that the palpigers *pgr* likewise tend to unite with the greatly elongated mentum *mn*, while the submentum has apparently become membranous, or is lost, in both insects. In the flea shown in Fig. 8 the palpigers *pgr* likewise show some indications of a tendency to unite with the mentum *mn* (although a suture still demarks the two regions in question); but the submentum *sm* has not yet become membranous, although it is greatly reduced, and is apparently "on the way" to become atrophied.

The tendencies exhibited by these insects help us to understand the condition exhibited by the labia of the insects shown in Figs. 3, 2 and 1, for in the latter series the submentum is apparently lost through becoming membranous, while the mentum *mn* becomes greatly elongated to form the long columnar region labelled *mn* in Figs. 1, 2 and 3. A comparison of the Mecopteran shown in Fig. 2, with the Mecopteran shown in Fig. 19, would indicate that the elongated sclerite *mn* of Fig. 2 is the mentum *mn* alone of Fig. 19, for the submentum *sm* of the Mecopteran shown in Fig. 22 is apparently not represented in either Fig. 19 or Fig. 2, but merely remains membranous in the Mecoptera there figured. It is also very probable that the elongated columnar sclerite labelled *mn* in the Neuropteran shown in Fig. 1 represents the mentum alone, rather than the mentum and submentum united, as I formerly thought to be the case.

With regard to the interpretation of the parts of the Neuropterous labium shown in Fig. 25 or Fig. 1, Dr. MacGillivray criticises me for interpreting the structures labelled *pgr* as the palpigers in Fig. 25, because he thinks that the structures *pgr* of Fig. 25 are really the labial stipites, and that it would be impossible for the palpigers to become approximated and intervene between the ligula *lg* and the mentum, becoming fused together in the process, and thereby suppressing the parts normally situated between the palpigers. Exactly this condition, however, has occurred in the labium of the Coleopteran shown in Fig. 21 or Fig. 11 in which a comparison with other members of the same order of insects, such as the insect shown in Fig. 29 (compare also Fig. 11 with Fig. 10) clearly demonstrates that the palpigers *pgr* of Fig. 21 have approached one another and have united mesally (so closely have they united that it would necessitate rupturing the chitin to separate them forcibly) while the labial stipites region *ls* (which intervened between the palpigers *pgr* in such insects as the one shown in Fig. 28, or Fig. 10) in Fig. 21 becomes completely suppressed on the surface there shown, so that the palpigers *pgr* intervene completely between the ligula *lg* and the mentum *mn* in an

unmistakable fashion. It is therefore unfortunate that Dr. MacGillivray could not have studied the common insect shown in Fig. 21 and compared it with other Coleoptera, or he would readily have seen how "that the palpigera could become fused to the surface of a sclerite, the prementum (he means the labial stipites) and suppress it, so that the palpigera would become the connecting sclerite between the mentum and ligula, to use Dr. Crampton's nomenclature"—a process which Dr. MacGillivray deemed impossible in any insect, and hence denied its possibility in the insect shown in Fig. 25 as well. If the seemingly impossible could occur in the insect shown in Fig. 21, I do not see why it could not also occur in the insect shown in Fig. 25; and, just as a comparison of the Coleopteran shown in Fig. 21 with other Coleoptera (such as those shown in Fig. 29 and 28, or in Figs. 11 and 10) clearly demonstrates that the palpigera *pgr* can and do intervene between the ligula *lg* and the mentum *mn* in the same way, a comparison of the Neuropteran shown in Fig. 25 with the other Neuroptera shown in Figs. 24 and 23 clearly demonstrates that the palpigera *pgr* can and do intervene between the ligula *lg* and the mentum *mn* in the Neuropteran shown in Fig. 25, despite Dr. MacGillivray's unsupported denial that such a condition could exist in the insect shown in Fig. 25; and the palpigera *pgr* of Fig. 25 are clearly the palpigera and are not the labial stipites as Dr. MacGillivray claims they are in this insect! A comparison with other insects (compare Fig. 25 with Figs. 24 and 23, or compare Fig. 25—or the same insect shown in Fig. 1—with Fig. 21) thus demonstrates that the interpretation given in Fig. 25 or Fig. 1 is entirely correct; and starting with Fig. 1, the interpretations given in the series from Fig. 1 to Fig. 3 and Fig. 4 are entirely justified by a detailed study of the parts.

Since a detailed study of the parts, and a comparison with other insects indicate that the interpretations given in the series from Fig. 1 to Fig. 4 are correct, Dr. MacGillivray's charge that in this series I have mistaken a mere superficial resemblance, or a mere "analogy in form," for true homology, is utterly without basis—and I may add that twenty years spent in an intensive study of comparative morphology have enabled me to distinguish between a mere superficial resemblance in outline, and true homology. "*De mortuis nihil nisi bonum*" is an expression "worthy of all acceptance," but the living are worthy of some consideration also and in the interest of the furtherance of the cause scientific truth and accuracy, such views as are in full accord with all of the known facts can not be lightly brushed aside as unwarranted assumptions unworthy of further consideration; and if students are to be taught that the labella of Diptera represent "paraglossae," they should at least be informed that there is another possible view as to the homologies of these structures!

In discussing the interpretations of the parts of the labium, Dr. MacGillivray has made two statements which will create confusion unless corrected. His statement that I applied the term *prementum* to the sclerites which Yuasa, 1920, had already termed "*stipulae*" is wholly mistaken. The structures which Yuasa refers to as "*stipulae*" (a term denoting "pin-feathers") are those which I have always called labial stipites (or labiostipites—i. e. *ls* of Fig. 26) following the usage of Dr. A. Boving, and the earlier Coleopterists, who refer to the structures in question as the labial stipites or "*stipites labii*" in Coleopterous larvae. As every student of Ornithology knows, in general zoological usage the term "*stipulae*" refers to "pin-feathers," and since the labial stipites of insects have nothing to do with "pin-feathers," I prefer to retain for them the older and more appropriate designation of labial stipites, or the single term labiostipites. Since I have always referred to these structures as the labial stipites (or labiostipites), it is obvious that I can not have called them the "*prementum*" as Dr. MacGillivray states. I have always used the term *prementum* to designate an area anterior to the *mentum*, and composed largely of the palpigers (i. e. the region labelled *pm* in Figs. 1 to 3, Figs. 5 to 8, Figs. 18 to 21, Fig. 30, etc.) with which the labial stipites may unite, and the ligula may also fuse as in Fig. 30. The *prementum* is thus clearly very different from the labial stipites alone (i. e. Yuasa's "*stipulae*"), and the term *prementum* is in no sense synonymous with Yuasa's term "*stipulae*," as Dr. MacGillivray mistakenly considers to be the case.

The area labelled *pm* in the Mecoptera shown in Figs. 13, 2, 18, 19, etc., which is homologous with the *prementum* of other insects (i. e. *pm* of Figs. 20, 21, etc.) is termed the "*mecaglossa*" by Otnes, 1922, who mistakenly considers that this "*mecaglossa*" is peculiar to the Mecoptera alone, and in this view he is upheld by Dr. MacGillivray. Aside from that fact that the designation "*mecaglossa*," meaning "long glossa," is singularly inappropriate for a structure which has nothing to do with the glossa, and in insects which have completely lost the glossa through atrophy, as is the case with the Mecoptera (which are supposed to be the only insects having a "*mecaglossa*"), it is entirely incorrect to refer to the *prementum* of the Mecoptera as a "*mecaglossa*" on the ground that it is not homologous with the *prementum* of other insects. If one will run through the series of insects shown in Figs. 13, 12, 11, and 10, it should be quite apparent that the *prementum pm* of the Mecopteran shown in Fig. 13, is homologous with the *prementum pm* of the Dipteran shown in Fig. 12 (compare also *pm* of Fig. 19 with Fig. 20) or the Coleoptera shown in Figs. 11 and 10, and there is no just reason for terming the region in question the "*mecaglossa*" in Mecoptera alone, ignoring its

homologue in other insects, unless exactly the same structure is to have a different name in each order of insects, which is absurd. In the Mecopteran shown in Fig. 13, the prementum *pm* is composed almost entirely of the enlarged and elongated palpigers *pgr*, as is also true of the Dipteran shown in Fig. 12, and the Coleopteran shown in Fig. 11, although in the Coleopteran shown in Fig. 11, the ligula *lg* is retained, while it is lost in the Mecoptera—but in some Coleoptera also, the ligula likewise disappears, and leaves a prementum composed almost entirely of the palpigers, as in the Mecoptera. Since the Mecopteran type of prementum is thus not confined exclusively to the Mecoptera, and since the glossa is entirely lost in these insects, I prefer to retain for the structure in question the designation prementum instead of the later unnecessary, and wholly inappropriate substitute term "mecaglossa," implying a long glossa in insects which have no glossa at all.

Dr. MacGillivray accuses me of unjustly criticising his student Otnes for not figuring a supposed cleft between the palpigers of the labium of the Mecopteran "*Panorpodes*," and he states that he "mistrusts that Dr. Crampton and Mr. Otnes are not writing about the same cleft," since there is no such cleft in "*Panorpodes*." The truth of the matter is that I did not mention *Panorpodes* at all, and I fail to see what *Panorpodes* has to do with the discussion, or why it was brought in by Dr. MacGillivray. It was an entirely different insect, namely, *Panorpa lugubris*, and not "*Panorpodes*," which I said had a distinct cleft between the distal portions of the palpigers (see the palpigers *pgr* of this insect shown in Figs. 13 and 19). Otnes claimed to have "examined numerous specimens of *Panorpa lugubris*" without being able to find the well-defined sutures demarking the basal portions of the palpigers *pgr* of Figs. 13 and 19 (compare also Fig. 18), and it was this unaccountable inability to see these perfectly obvious sutures in *Panorpa lugubris* (shown in Figs. 13, 19, etc.) that I criticized in Mr. Otnes. No mention whatsoever was made of *Panorpodes* by me, as may be seen by referring to page 174 of Vol. 25 of these "Proceedings," and since I have never stated or implied that "*Panorpodes*" had such a suture or cleft, I am utterly at a loss to understand why Dr. MacGillivray accuses me of so doing, or why he brings in the wholly extraneous subject of *Panorpodes*' labium, and ignores the fact that I referred distinctly and specifically to *Panorpa lugubris*, not to "*Panorpodes*."

But one other criticism of Dr. MacGillivray's remains yet to be answered, namely, that I chose the "tips of lines of evolution" to illustrate the steps or stages in the process of evolving the elongated Dipterous type of labium. While I did not restrict the discussion to the most highly modified members alone,

in each of the insectan orders, as Dr. MacGillivray would imply, I did, however, arrange a series of elongated labia chosen from successively higher Holometabolous orders, arranged in an ascending series of modificational stages to illustrate the probable steps through which the precursors of the Dipterous type of labium may have passed, in the derivation of this type of labium from successively more primitive or less modified types. There was no implication that any member of the progressive series was ancestral to any other member of the series, since the insects figured were all recent, *living* forms, and it should be obvious to any one that contemporaries can not be actually ancestral to each other. On the other hand, some living insects have not travelled so far as others have along certain paths of development which they all are apparently following, and these, remaining virtually stationary at different levels of development, serve as "mile stones" to mark the stages through which those forms which have "forged ahead" have passed, in assuming their advanced condition. This is a well known and recognized phenomenon throughout the world of living things, and should furnish no cause for surprise or criticism, since it is familiar to every student of evolution. It is but natural that the modificational tendencies exhibited by a "higher" or "derived" group of insects shall be foreshadowed in some of the members of a closely related more primitive or "ancestral" group. One is therefore perfectly justified in comparing the elongated Dipterous type of labium, for example, with the similarly modified elongated type of labium exhibited by the members of the closely related "ancestral" order Mecoptera, and so on down the evolutionary scale, and it is only by comparing the parts of the labium of a modified type with a *similarly modified* labium of a closely related, but slightly more primitive form, that we can hope to reach a correct conclusion concerning the homologies of the parts, and the method by which the higher types have come to assume their present form. Furthermore, it was far preferable to choose *actual cases*, rather than purely hypothetical ones, to illustrate the successive evolutionary stages in the production of the Dipterous type of labium, since what nature has done, at least shows what nature is able to do, and this method of procedure has enabled me to avoid the pitfall of assuming for the Diptera a condition of affairs wholly unknown in any insects whatsoever, and wholly at variance with all of the modificational tendencies of all of their allies—namely, that the paraglossae shall become segmented and enormously developed, while the labial palpi become completely suppressed.

In searching for certain definite landmarks demarking the limits of the various areas of the labium, I have been greatly disappointed that some features which gave promise of being

of value, seemed to fail in some cases, and therefore could not be used as trustworthy criteria in all instances. Thus, the attachment of the basimaxillary membrane, or the membrane connecting the basal region of the maxilla with the labium, might be used in some cases in determining the distal limits of the mentum. Similarly, the points of articulation of the maxillary condyles, or the location of the gular pits, might be taken to demark the posterior (proximal) limits of the submentum; but these landmarks are unsatisfactory in that they appear to shift their position in some insects, so that it has seemed preferable to use the comparative method of study in attempting to determine the limits of the various regions of the labium, and by using the primitive forms as the basis of comparison, one can quite readily determine the homologies of the parts in the more specialized forms if he be so fortunate as to obtain the intermediate stages connecting the lower with the higher types.

A study of the origin and insertion of the various labial muscles would be of the utmost value in such a study, and should afford a "last court of appeals" for determining disputed points. I must confess, however, that I have avoided the study of the musculature whenever possible, since the eye-strain involved is too great when one is dealing with the labia of insects which are so small that it is difficult to see the parts of the entire labium with the higher powers of the dissecting microscope. Furthermore, it is necessary to have material preserved in fluid in order that the muscles may be preserved for dissection, and in many instances it is impossible to obtain the desired material suitably preserved. A study of the musculature, however, has so frequently confirmed the conclusions reached from the comparison of the labia through a long series of intermediate forms connecting the higher with the more primitive types, that the latter method seems to be quite reliable, and in most instances has furnished the basis for the conclusions here set forth—though whenever feasible, the evidence of comparative morphology has been tested by a study of the musculature as well.

With regard to the interrelationships indicated by a study of the labia of Holometabolous insects, it may be mentioned that the division of the Holometabola into higher Holometabola (or "Panmecoptera"—i. e. the Siphonaptera, Diptera, Mecoptera, Trichoptera and Lepidoptera) and lower Holometabola (or "Panneuroptera"—i. e. Hymenoptera, Coleoptera, Strepsiptera and Neuroptera) on the basis of the evidence offered by other features of the body, receives confirmation through a study of the labium, in that the labia of the higher Holometabola tend to lose the ligula entirely, while the palpigera become approximated mesally, and the labial palpi form the terminal

portion of the labium in all of the higher Holometabola I have examined. In the lower Holometabola, on the other hand, there is a tendency to retain the ligula (though some lose it) and the palpigers become approximated less frequently, so that the retention of the ligula prevents the labial palpi from forming the terminal portion of the labium in most of the lower Holometabola. In this respect, the Neuroptera are more closely allied with the lower Holometabola than with the higher Holometabola; but the modifications of the labium exhibited by such Neuroptera as the one shown in Fig. 1 would indicate that there exist in the Neuropterous stem certain evolutionary tendencies which are characteristic of some higher Holometabola, such as the ones shown in Figs. 2 and 3; and while the Neuropteran shown in Fig. 1 is in no sense ancestral to the higher Holometabola shown in Figs. 2 and 3, it nevertheless shows that certain Neuroptera exhibit tendencies which find opportunity for fuller expression in the higher Holometabola and in a sense, the Neuroptera are intermediate between the higher and lower Holometabola.

Of the lower Holometabola, the Neuroptera and Coleoptera are very closely related, according to the evidence of the larval mouthparts, and a study of the labium of the adults would tend to support this view. The study of other parts of the body would indicate that the Coleoptera are also very closely related to the Hymenoptera, but, unfortunately, the Hymenopterous material which I have at my disposal does not present very marked resemblances between the two groups in so far as the labium of the adults is concerned. In the reduction of the submentum *sm* and the elongation of the mentum *mn*, however, the Hymenopterous and Coleopterous labia shown in Figs. 34 and 29 are quite similar, and the same modificational tendencies thus appear, to some extent, in both groups. The labium of the Strepsiptera is so greatly reduced that it offers no particular evidence of relationship to the Coleoptera, although the labium of certain Meloid Coleopterous larvae resembles that of the larval Strepsiptera quite closely.

A study of the labium of the higher Holometabola would indicate that the Trichoptera (Fig. 14) are very closely related to the Lepidoptera (Fig. 15), since in both the ligula disappears while the palpigers remain distinct and the labial palpi are usually quite well developed. The evidence of the labium is thus in accord with that drawn from other sources indicating a close relationship between the Lepidoptera and Trichoptera. The resemblances between the parts of the labium of the Diptera (Figs. 3 and 20) and the Mecoptera (Figs. 2, 19, etc.) are very striking and bear out the evidences of an extremely close relationship between the Diptera and Mecoptera indicated by other body structures as well. The labium of the flea shown

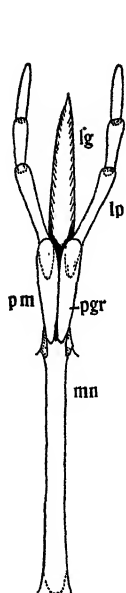


Fig. 1

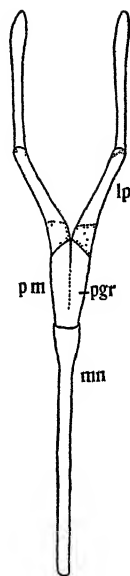


Fig. 2

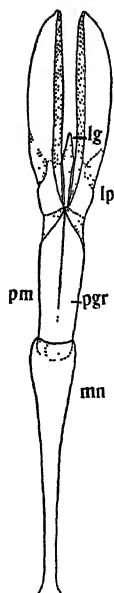


Fig. 3

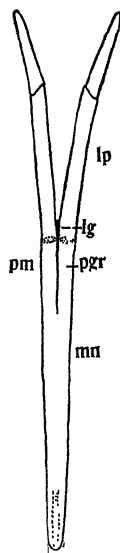


Fig. 4

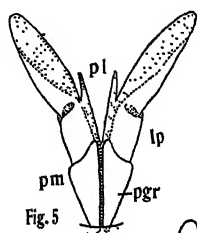


Fig. 5

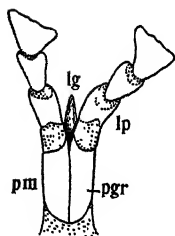


Fig. 6

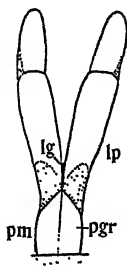


Fig. 7

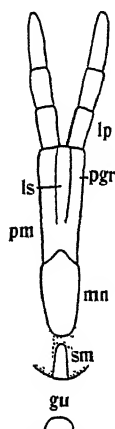


Fig. 8

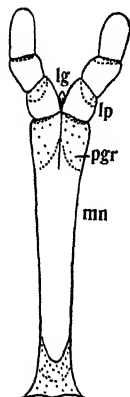
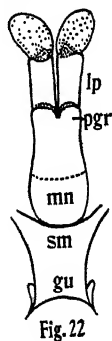
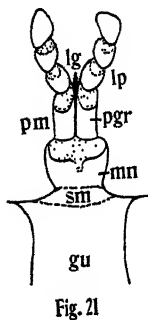
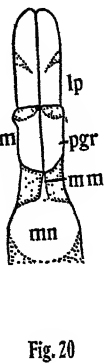
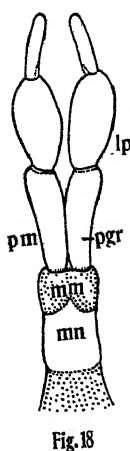
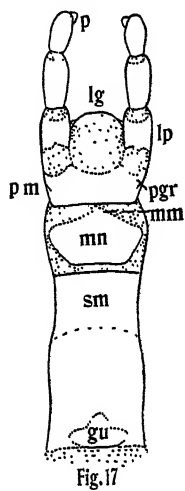
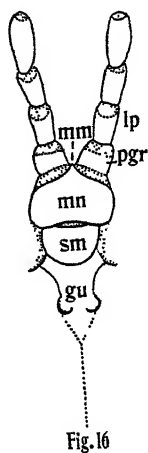
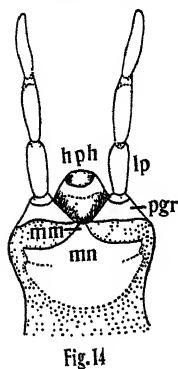
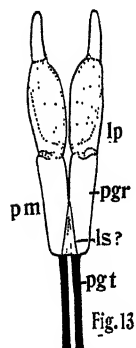
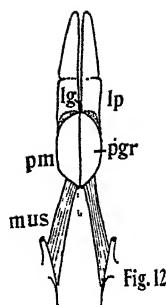
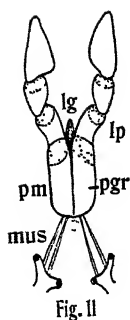
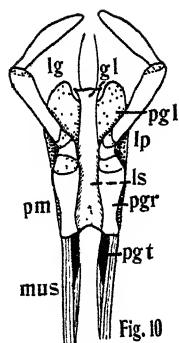


Fig. 9



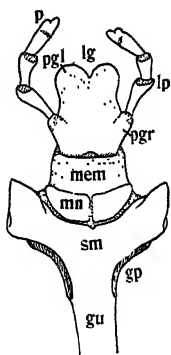


Fig. 23

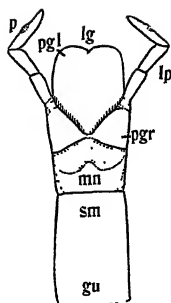


Fig. 24

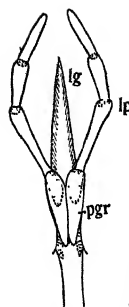


Fig. 25

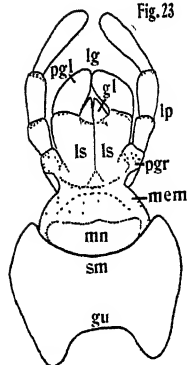


Fig. 26

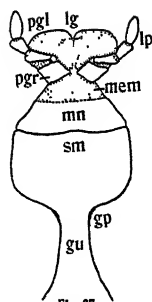


Fig. 27

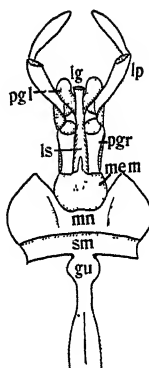


Fig. 28

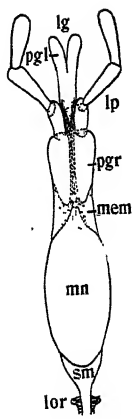


Fig. 29

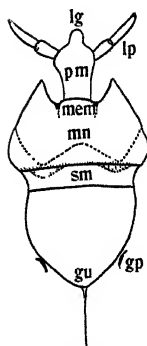


Fig. 30



Fig. 31

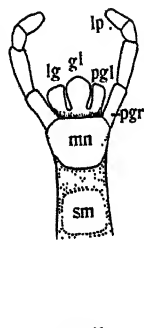


Fig. 32

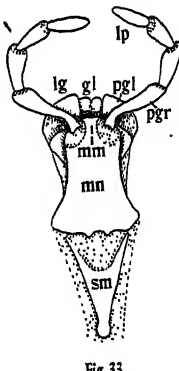


Fig. 33

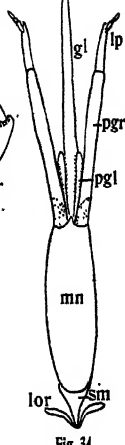


Fig. 34

in Fig. 8 resembles the labia of certain Diptera and Mecoptera in most respects, but it also resembles the labia of certain Coleoptera in having a distinct submentum separated from the mentum by a membrane.

In the main, the evidence of the labium is in accord with that furnished by other parts of the body, in indicating the relationships of the Holometabola suggested in previous papers, and a study of the labium would point to an Orthopteroid ancestry for the Holometabola. This Orthopteroid ancestry is doubtless to be sought in the Protorthoptera or in the common Protorthopteran-Protoblattid stem from which such forms as the Zorapterous Psocids (which approach the Holometabola very closely in many respects) were also derived.

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Abbreviations.

- gl* —Glossa.
gp —Gular pit (gularcava).
gu —Gula.
hph —Hypopharynx.
lg —Ligula (composed of united glossae and paraglossae).
lo —Palpigeral lobes.
lor —Lora.
lp —Labial palpus.
ls —Labial stipes (labiostipes).
mem —Mental membrane.
mm —Median mental process (medimentum).
mn —Mentum.
mus —Palpigero-gular muscles, connecting palpigers with gular region (or postentoria).
p —So-called "palpimaculae"; probably (chemical) sense organs.
pgl —Paraglossa.

- pgr* —Palpiger.
pgt —Palpigeral tendons.
pl —Palpal lobes (palpilobi).
pm —Prementum.
sm —Submentum.

EXPLANATION OF PLATE 6.

All of the labia are drawn from the posterior (ventral) surface. Stippling denotes membrane.

Fig. 1. Neuropteran, *Nemoptera sinuata*. Fig. 2. Mecopteran, *Bittacus* sp. Fig. 3. Dipteran, *Tanyderus*. Fig. 4. Dipteran, *Empis clausa*. Fig. 5. Dipteran, *Asyndulum montanum*. Fig. 6. Coleopteran, *Calopteron* sp. Fig. 7. Dipteran, *Edwardsina* sp. Fig. 8. Siphonapteran, *Pulex serraticeps*, after Boerner, 1903. Fig. 9. Coleopteran, *Lycus* sp.

EXPLANATION OF PLATE 7.

Fig. 10. Coleopteran, *Harpalus caliginosus*. Fig. 11. Coleopteran, *Calopteron* sp. Fig. 12. Dipteran, *Anisopus* (*Ryphus*). Fig. 13. Mecopteran, *Panorpa lugubris*. Fig. 14. Trichopteran. Fig. 15. Lepidopteran, *Sabatinka* sp. Fig. 16. Coleopteran, *Phengodes* sp. Fig. 17. Neuropteran, *Sialis* sp. Fig. 18. Mecopteran, *Chorista australis*. Fig. 19. Mecopteran, *Panorpa lugubris*. Fig. 20. Dipteran, *Anisopus* (*Ryphus*) *punctatus*. Fig. 21. Coleopteran, *Eros* sp. Fig. 22. Mecopteran, *Nannochorista dipteroides*.

EXPLANATION OF PLATE 8.

Fig. 23. Neuropteran, *Corydalus cornutus*. Fig. 24. Neuropteran, *Porismus strigatus*. Fig. 25. Neuropteran, *Nemoptera sinuata*. Fig. 26. Blattid, *Periplaneta* (*Blatta*) *orientalis*. Fig. 27. Coleopteran, *Silpha* sp. Fig. 28. Coleopteran, *Harpalus caliginosus* (pale individual showing gular sutures). Fig. 29. Coleopteran, *Rhipiphorus dimidiatus*. Fig. 30. Coleopteran, *Hydrophilus* (larva). Fig. 31. Coleopteran, *Cupes* sp. Fig. 32. Hymenopteran, *Xyela* sp. Fig. 33. Hymenopteran, *Chalybion cyaneum*. Fig. 34. Hymenopteran, *Bombus* sp.

A NEW CHIGGER (TROMBICULA LARVA) FROM BRAZIL.

By H. E. EWING, U. S. Bureau of Entomology.

Professor J. Bequaert, of the Harvard School of Tropical Medicine, recently sent the writer a collection of ectoparasites from Brazil for determination. In this collection were included three lots of *Trombicula* larvae. An examination of these larvae shows that all of them belong to a single species which proves to be new. It is here described.

***Trombicula brasiliensis*, new species.**

Larva.—Palpi of the usual shape for the genus, segment II being somewhat swollen and broadly rounded laterally. Seta on second palpal segment barbed for its whole length; seta on third palpal segment with either one or two barbs, or short lateral branches; seta on fourth palpal segment nude. Palpal claw bifurcate, with the outer division of claw much longer and stouter than the inner. Palpal thumb short, slightly swollen and not reaching the tip of the inner division of palpal claw. It bears several pectinate setae. Galeae large, cupped, over-hanging lobes; each with a simple dorsal seta. Chelicerae large and broad at the base, but tapering to the tip for their whole length. Above, each chelicera bears a minute, backwardly directed tooth near the apex, and ventrally each chelicera is notched somewhat posterior to the tooth. Dorsal shield about twice as broad as long; front margin about straight but hind margin very convex, or outwardly rounded. At each four corners and at the middle of the front margin of the dorsal shield is situated a long pectinate seta. Pseudo-stigmatic organs long, slender and pectinate except near their bases. Abdomen with fourteen pairs of dorsal setae arranged into four irregular transverse rows as follows beginning with the most anterior row: 6, 8, 8, 6. Below, the abdomen bears nine pairs of setae; an anterior transverse row of 6, followed by a transverse row of 4, then a single pair near the median line, a transverse row of 4 setae and a posterior single pair of setae near the median line. Each coxa bears a single pectinate seta, and between the first coxae there is a pair of sternal setae and also a pair between the posterior coxae.

Length (unengorged), 0.20 mm.; width, 0.16 mm.

Type host.—(?).

Type locality.—Manáos, Brazil.

Type slide.—Cat. No. 946, U. S. N. M.

Description based upon three specimens mounted on type slide. They were taken at Manáos, Brazil, July 25, 1924, and constituted a part of a lot from this place sent in by Professor Bequaert. Two other lots of the same species were received from the same authority, one taken at Carvoeiro, Brazil, August 26, 1924, and the other at Para, Brazil, July 13, 1924.

This species belongs to that group of *Trombicula* larvae in which the palpal claw is bifurcate and the outer division larger than the inner. It is nearest to *Trombicula goldii* (Oudemans), but differs from Oudemans's species in having one or two branches to the second palpal seta instead of none and in having several more abdominal setae both dorsal and ventral.

Actual date of publication, April 27, 1925.

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NEW SERPHOID PARASITES FROM THE UNITED STATES
(HYMENOPTERA).

BY ROBERT M. FOUTS.

This paper contains descriptions of twenty-four new species and one new genus of Hymenoptera belonging to the families Platygasteridae, Diapriidae and Scelionidae.

All measurements except of antennal joints were made with a Bausch and Lomb binocular microscope, 24 mm. objective, No. 5 ocular and a micrometer disc ruled to five mm. in .05 mm. divisions. Each division equals approximately .0108 mm. Measurements of antennal joints were made with a Bausch and Lomb compound microscope, 4 mm. objective, No. 5 ocular, 160 mm. draw tube, and a micrometer disc ruled to five mm. in .05 mm. divisions.

The measurements made are close but only approximately correct. A difference of .002 mm. in antennal measurements means nothing. All measurements of a particular part are of its greatest dimensions.

The publication referred to as "(Fouts, 1924)" is the author's recent paper entitled, "Revision of the North American Wasps of the Subfamily Platygasterinae." It was published in the Proceedings of the United States National Museum, Vol. 63, 1924, pp. 1-145.

Unless otherwise mentioned the type material described below is in the author's collection.

Superfamily SERPHOIDEA.

Family PLATYGASTERIDAE.

Trichacis cornuta, new species.

Female.—Length, 1.53 mm. Runs to *cornicola* in the author's key (Fouts, 1924, p. 13). Differs from *cornicola* and *texana* in having lateral projections on the cheeks. Length of head 20, width 48; frons polished; occiput without sculpture medially; cheeks just above the middle of the compound eyes with a sharp laterally projecting tooth; pedicel a little over twice as long as wide, distinctly but only very slightly wider than any of the four following joints, a little longer than joint four which is cylindrical, twice as long as wide; length of thorax 55, width 40, height 44; notauli distinct only on basal third of mesonotum; length of abdomen 67; length of second tergite 42, width 42; first tergite as in *texana*; interfoveal area on second tergite with many short fine carinae; second tergite, except as just mentioned, and all following tergites, polished, without distinct

sculpture. Coloration as in *texana*, the flagellar joints a little darker brown, however.

Type-locality.—Brownwood, Texas.

Described from one specimen collected by the author, May 1, 1924, in Pecan Bayou.

***Trichacis texana*, new species.**

Female.—Length, 1.59 mm. Runs to *cornicola* in the author's key (Fouts, 1924, p. 13). Has the pedicel distinctly wider than any of the four joints following it. The pedicel is, moreover, not distinctly longer than the fourth joint. Length of head 22, width 45; frons polished; occiput separated from the vertex by a sharp carina; length of thorax 55, width 36, height 43; notauli distinct on basal six-sevenths of the mesonotum; length of abdomen 70; length of second tergite 44, width 40; median area on first tergite well defined, longer than wide, with a median carina; last four tergites faintly punctulate. Black; first six antennal joints and legs in greater part, brown; club joints, coxae and femora, darker.

Type-locality.—Brownwood, Texas.

Described from one specimen collected by the author, April 24, 1924, in Pecan Bayou.

***Platygaster affinis*, new species.**

Female.—Length, 1.34 mm. Runs to *astericola* in the author's key (Fouts, 1924, p. 30). Differs from *astericola* in not having numerous diagonally directed striae on the frons above the antennae. *Affinis* is, moreover, much darker in color but this may be due to the length of time the specimens of *astericola* have been in the collection. Length of head 20, width 36; length of thorax 47, width 34, height 34; notauli distinct on basal two-thirds of mesonotum; length of abdomen 57; length of second tergite 35, width 30; foveae not well indicated, a few striae present, the striae not attaining the middle of the segment; black to piceous, the tarsi and tibiae basally, brown.

Type-locality.—Brownwood, Texas.

Described from one specimen collected by the author, June 10, 1924, in Pecan Bayou.

***Platygaster anura*, new species.**

Female.—Length, 1.42 mm. Differs from *minutissima* in having fine wavy aciculae above on the frons. Length of head 18, width 33; antennal joints eight and nine a little longer than wide; length of thorax 41, width 30, height 30; notauli complete; mesonotum shagreened; length of abdomen 72; length of second tergite 32, width 28; third tergite divided medially by a longitudinal incision; length of third tergite 6, of the fourth 8, of the fifth 14, and of the sixth 8; basal foveae with a few striae scarcely extending beyond their apices; abdominal tergites otherwise unsculptured; wings tinged with brown.

Male.—Length, 1.29 mm. Pedicel about one and one-half times as long as wide, twice as long but no wider than joint three; joint four wider, widened apically, slightly excavated inwardly, about as long as the pedicel; joints five to nine subequal, quadrate; ten conical, about as long as three and four united,

acute apically; length of head 19, width 36; length of thorax 45, width 32, height 32; length of abdomen 55; length of second tergite 32, width 32.

Type-locality.—Brownwood, Texas.

Described from nine specimens collected by the author, May 1, 1924, in Pecan Bayou.

Paratypes (male and female).—Cat. No. 28111, U. S. N. M.

***Platygaster filicaudis*, new species.**

Male.—Length, 2.15 mm. This species forms a new section of the genus *Platygaster* characterized by the scutellar structure. Length of head 22, width 32; head shining, finely granular; lateral ocelli their diameter distant from the eye margin; lengths of antennal joints in millimeters: 1.253, .389, .227, .497, .162, .281, .270, .281, .281, .410; widths of the same joints as follows: .324, .216, .162, .270, .194, .248, .259, .259, .248, .227; fourth joint broadly but not deeply excavated at base; pubescence on flagellar joints sparse, about half as long as the widths of the joints; length of thorax 65, width 40, height 38; thorax, except the pleurae and the propodeum, shining, finely reticulate; notauli complete, the median lobe narrowly truncated posteriorly, its apex coinciding with the apices of the lateral lobes; scutellum transversely elevated medially, granular, with a number of very small, indistinct, longitudinal carinae; dorsal plate of the scutellum upturned apically, forming a small tubercle; lengths of the tergites, beginning with the second: 50, 11, 15, 19, 13, 4; widths of the same tergites: 32, 29, 25, 20, 15, 10; second tergite subopaque, granular, with a few carinae laterally extending past the middle; basal foveae not present, or rather both foveae are merged and form one broad shallow depression; third and fourth tergites finely reticulate; fifth tergite finely reticulate, with a delicate median carina and several even more delicate ones laterally; sixth tergite finely reticulate, polished posteriorly; seventh tergite polished; wings hyaline, the anterior pair 135 in length; black; legs rufous; last joint of each tarsus dark brown; scape rufous on basal half; antennal joints dark brown.

Type-locality.—Paradise Key, Florida.

Described from one specimen collected by the author, Feb. 27, 1919.

***Platygaster kalmiae*, new species.**

Male.—Length, 1.73 mm. Runs to *artimesiae* in the author's key (Fouts, 1924, p. 28) and differs in having the frons much more strongly sculptured. Length of head 24, width 46; frons entirely strongly aciculate, transversely striate above the antennae; occiput strongly carinate; fourth antennal joint a little wider than the pedicel, slightly emarginate basally, scarcely widened apically; ninth antennal joint about as wide as long; length of thorax 65, width 41, height 45; notauli sharply indicated to middle of mesonotum; scutellum evenly convex, highly elevated, sparsely pubescent; length of abdomen 71; length of second tergite 45, width 43; striae extending to the middle of the segment; black; antennae piceous; legs dark brown; anterior femora and tibiae, in part, yellowish.

Type-locality.—Glen Echo, Maryland.

Described from two specimens collected by the author, April 24, 1918, on the leaves of mountain laurel.

Paratype.—Cat. No. 28112, U. S. N. M.

***Platygaster minutissima*, new species.**

Male.—Length, 0.87 mm. Runs to *americana* in the author's key (Fouts, 1924, p. 25). Length of head 13, width 25; frons polished, without apparent sculpture; occiput finely striate; pedicel one and one-half times as long as wide; fourth joint about as long as the pedicel, excavated inwardly, broad; ninth joint quadrate; length of thorax 30, width 23, height 23; mesonotum shagreened, smoother posteriorly; length of abdomen 38; length of second tergite 19, width 22; foveae indicated by a short acute ridge inwardly, without distinct striae; black; anterior trochanters, anterior tibiae, tarsi, and flagellum, brownish.

Type-locality.—Brownwood, Texas.

Described from one specimen collected by the author, May 1, 1924.

***Platygaster perplexa*, new species.**

Male.—Length, 1.42 mm. Runs to *vernalis* in the author's key (Fouts, 1924, p. 27). Differs from *vernalis* and *tacita* in many ways as the following description shows: length of head 22, width 33; frons subopaque by reason of a fine sculpture, finely carinate above the antennae; occiput finely reticulate; all antennal joints longer than wide, the flagellar joints densely covered with rather long whitish hairs; fourth joint a little longer than the pedicel, about as long as the sixth, excised basally but not much wider apically than basally, less than twice as long as wide; following joints subequal in width, gradually increasing in length; ninth joint about three times as long as wide; tenth joint much longer, acuminate, seven or eight times as long as wide; length of thorax 46, width 30, height 31; notauli distinctly indicated to anterior third of mesonotum; scutellum rather small, nearly flat, sparsely pubescent; wings a little longer than the whole length of the body, narrow, ciliate marginally; abdomen convex above and below, without sculpture or appreciable pubescence; length of abdomen 63; length of second tergite 40, width 33; basal foveae extremely minute, without sculpture; body piceous to dark reddish-brown; scape yellowish basally; all coxae and trochanters yellow; rest of legs brownish-yellow; tarsi yellow.

Type-locality.—Grant, Colorado.

Described from one specimen collected by the author, July 21, 1916.

***Platygaster scutellator*, new species.**

Male.—Length, 0.83 mm. This species and the one immediately following form a new section of the genus *Platygaster* characterized by the mesonotal structure. The posterior lobe of the mesonotum extends tongue-like over about half of the scutellum and is truncated apically. The scutellum is densely pubescent except for a small area on top, is very short and declivous posteriorly. Length of head 13, width 24; face without distinct sculpture; vertex with a few transverse carinae; lateral ocelli a little less than their own diameter distant from the margin of the eye; pedicel scarcely longer than wide, a little narrower than the fourth joint; fourth joint somewhat less than twice as long as wide,

cylindrical, shorter than the ninth joint, the latter about twice as long as wide; length of thorax 32, width 21, height 25; mesonotum polished, without sculpture; notauli briefly indicated posteriorly; abdomen broadly ovate, subacute apically; length of abdomen 32; length of second tergite 16, width 19; basal foveae small, with one or two faint carinae outwardly, the carinae not extending posteriorly to the apices of the foveae; interfoveal area not sculptured; wings hyaline, with long fringes, the anterior ones 70 in length; body shining black; legs golden-brown, the femora and tibiae apically and the posterior tarsi entirely, darker.

Type locality.—Glen Echo, Maryland.

Described from one specimen collected by the author, July 4, 1919.

***Platygaster rufidens*, new species.**

Male.—Length, 0.75 mm. Length of head 13, width 22; face without distinct sculpture; vertex with a few transverse carinae; lateral ocelli as in *scutellator*; lengths of antennal joints in millimeters: .156, .041, .012, .053, .037, .051, .053, .055, .055, .090; widths of the same joints as follows: .027, .025, .016, .027, .023, .025, .025, .027, .025, .025; length of thorax 30, width 19, height 21; thorax otherwise as in the preceding species; length of abdomen 26; length of second tergite 16, width 16; basal foveae with several carinae within their borders; interfoveal area with a very small sulcus basally; wings hyaline, with long fringes, the anterior pair 64 in length; body shining black; legs dark brown, except all trochanters, anterior and middle tibiae basally, and anterior and middle tarsi (the last joint of each excepted). The parts just mentioned yellow to golden brown.

Type locality.—Glen Echo, Maryland.

Described from one specimen collected by the author, July 15, 1917.

***Platygaster signata*, new species.**

Female.—Length, 1.90 mm. This species with *floridensis*, *caryae*, and *anormis* form a distinct group characterized by the scutellar structure. The scutellum is highly elevated, declivous anteriorly and posteriorly, not evenly shagreened in any place, but rather, roughened anteriorly, obscurely longitudinally striate anteriorly. *Signata* differs from *caryae* in not having the second tergite extensively striate. Length of head 28, width 55; head sculptured as in *caryae* (See Fouts, 1924, p. 37), somewhat more delicately so, however; scape long and slender, as long as the six succeeding joints united; pedicel nearly three times as long as wide, narrowed basally, distinctly longer than either the third or fourth joints; third joint about as long as the fourth, narrower than the fourth, a little over twice as long as wide; fourth joint wider than the pedicel, less than twice as long as wide; following six joints forming a club, all of them, except the last, transverse; length of thorax 73, width 50, height 50; notauli distinct to middle of mesonotum; mesonotum in greater part minutely reticulate; length of abdomen 75; length of second tergite 52, width 50; foveae deep and broad, on each side with a few striae which do not extend past their apices; shining black; antennae, except the terminal six joints, and legs, except the coxae and posterior femora, brownish-yellow.

Type-locality.—Brownwood, Texas.

Described from three specimens collected by the author, in May, 1924, on Pecan leaves.

Paratype.—Cat. No. 28114, U. S. N. M.

***Platygaster striatifrons*, new species.**

Male.—Length, 1.96 mm. This species forms a new group characterized by the scutellar structure. The dorsal surface of the scutellum is strongly convex, and the posterior face has an inverted U-shaped carina upon it. Length of head 23, width 53; frons strongly transversely carinate just above the antennae, with wavy aciculae otherwise; occiput strongly arcuately carinate; fourth antennal joint about as long as the fifth, distinctly emarginate basally, not widened at apex; following joints to the tenth subequal, a little longer than wide, densely covered with short silvery hairs; tenth joint cylindrical, a little narrower than the ninth, subacute apically; length of thorax 73, width 50, height 55; mesonotum strongly convex, without distinct sculpture, and without notauli except at extreme base; scutellum densely covered with moderately long silvery hairs; length of abdomen 85; length of second tergite 51, width 48; basal foveae rather long and moderately deep, with numerous striae extending beyond the middle of the segment; shining black; antennae piceous; legs dark brown; anterior femora in greater part, anterior tibiae and tarsi yellowish-brown.

Type-locality.—Glen Echo, Maryland.

Described from four specimens collected by the author, April 24, 1918. Two of the specimens were collected on the leaves of skunk cabbage and one on the leaves of mountain laurel.

Paratype.—Cat. No. 28115, U. S. N. M.

***Platygaster tacita*, new species.**

Female.—Length, 1.36 mm. Runs to *vernalis* in the author's key (Fouts, 1924, p. 27). Length of head 21, width 39; frons finely diagonally aciculate; occiput rather strongly striate; antennae not attenuate, the eighth and ninth joints about as wide as long; length of thorax 50, width 33, height 35; median lobe of mesonotum broadly rounded, not touching the scutellum; length of abdomen 55; length of second tergite 34, width 32; foveae deep, rather narrow, the striae very numerous, not reaching the middle of the segment; following tergites short, not sculptured; black, tarsi piceous.

Type locality.—Brownwood, Texas.

Described from one specimen collected by the author, May 1, 1924, in Pecan Bayou.

EUXESTONOTUS, new genus.

This genus differs from *Platygaster* in having a narrow scutellar suture and parallel, widely separated notauli. The notauli diverge slightly in front of the scutellum.

In *Platygaster* there is a rather broad depression between the scutellum and the mesonotum. The posterior margin of the mesonotum and the anterior margin of the scutellum are distinctly depressed. Such is not the case in

Euxestonotus. The two sclerites are not separated by a depression but rather by a very narrow suture. The notauli always converge posteriorly in *Platy-gaster*.

It is possible that *Euxestonotus* includes forms which Foerster had in mind when he described his genus *Xestonotus*.

Genotype.—*Anopedias error* Fitch.

TABLE OF SPECIES.

1. Legs yellow..... *flavipes* n. sp.
Legs mostly black or brown.....2.
2. Head less than twice as wide as long..... *rufidens* n. sp.
Head about twice as wide as long.....3.
3. Antenna elongate, the ninth joint longer than wide..... *error* (Fitch).
Antennae shorter, the ninth joint quadrate..... *brevicornis* n. sp.

Euxestonotus flavipes, new species.

Female.—Length, 1.10 mm. Length of head 17, width 30; frons polished; occiput reticulate; antennal joints four to nine subequal in length, all a little longer than wide; length of thorax 39, width 26, height 27; length of abdomen 46; length of second tergite 30, width 24; basal foveae not present, a few short striae indicating their position; legs, scape, second and third antennal joints, and mandibles, stramineous; rest of antennae brownish.

Type-locality.—Glen Echo, Maryland.

Described from two specimens collected by the author, July 15, 1917.

Paratype.—Cat. No. 28116, U. S. N. M.

Euxestonotus rufidens, new species.

Male.—Length, 1.27 mm. Length of head 20, width 33; frons polished; occiput reticulate; fourth antennal joint about as long as the pedicel, slightly widened at extreme apex and sharply acute outwardly; joints six to ten a little longer than wide, cylindrical, pilose; length of thorax 50, width 31, height 36; length of abdomen 48; length of second tergite 35, width 32; striae rather numerous, extending to middle of segment; body shining black; trochanters, all tibiae basally, and the anterior tibiae apically, and the tarsi, yellowish; mandibles rufous; antennae piceous, the scapes below, yellow.

Type locality.—Carlisle, Pennsylvania.

Described from five specimens collected by the author. They were collected, July 30, and August 4, 1920, on the leaves of mulberry and wild cherry trees.

Paratype.—Cat. No. 28117, U. S. N. M.

Euxestonotus brevicornis, new species.

Female.—Length, 1.03 mm. Length of head 16, width 30; frons polished; occiput reticulate; pedicel about as long as the two following joints united, as wide as the fourth, less than twice as long as wide; joints seven, eight, and nine subequal, quadrate; ten a little longer, conical, subacute apically; length of thorax 37, width 25, height 27; thorax polished, except the anterior part of the

mesonotum which is delicately reticulate; length of abdomen 42; abdomen polished and unsculptured except for the striae on the second tergite; length of second tergite 27, width 22; striae few, not attaining the middle of the segment; shining black; trochanters, femora, tibiae and scapes basally, and tarsi, yellowish to brown.

Type locality.—Glen Echo, Maryland.

Described from two specimens collected by the author in the summer of 1923.

Paratype.—Cat. No. 28118, U. S. N. M. This specimen is slightly smaller than the type.

***Leptacis angustula*, new species.**

Female.—Length, 0.99 mm. Runs to *pennsylvanica* in the author's key (Fouts, 1924, p. 117). Differs from *pennsylvanica* and *carinator* in the structure of the scutellum and the head. Length of head 14, width 21; head shaped much as in *Cephalonomia*, the height of the head above the eyes being three-fourths the length of the eyes; frons polished; vertex and occiput without distinct sculpture; pedicel about twice as long as wide, a little longer than the following two joints united, nearly twice as wide as the third joint; joints three, four, and five subequal in width, the third distinctly the longest; joint nine wider than long; ten less than twice as long as wide, conical; length of thorax 36, width 17, height 21; thorax without distinct sculpture, sparsely covered above with short white hairs; notauli absent, their origins indicated by the median lobe which projects upon the anterior margin of the scutellum; scutellum about as wide as long, with a few short hairs laterally, the spine very short and inconspicuous; marginal cilia on anterior wings very short; length of abdomen 42; greatest thickness of abdomen 12; abdomen highly polished, without sculpture; length of second tergite 25, width 16; no pubescence on second tergite except two small patches basally; body shining black; scape, pedicel, trochanters, anterior femora apically, anterior tibiae in greater part, middle and posterior tibiae apically, and all tarsi, yellowish to light brown.

Type locality.—Glen Echo, Maryland.

Described from one specimen collected by the author, April 24, 1918.

***Leptacis platygaster*, new species.**

Female.—Length, 1.49 mm. Runs to *pallipes* in the author's key (Fouts, 1924, p. 117). Differs in having the abdomen long and flat. Length of head 17, width 31; frons delicately reticulate laterally, more distinctly so above on the sides; occiput without distinct sculpture; scape rather short and thick, a little wider than joint nine, as long as the five following joints united; pedicel less than twice as long as wide, as long as, but considerably narrower than joint seven; joints three to six subequal in width, the fourth distinctly the longest; sixth joint a little wider, as long as the fifth; joints seven to ten subequal, about as wide as long; joint ten longer and narrower, about twice as long as wide, conically acute apically; length of thorax 47, width 23, height 31; thorax polished, without sculpture, sparsely covered with very short hairs dorsally; notauli absent; median lobe of mesonotum very minute, not touching the scutellum; scutellum

as in *angustula* but with the spine about half as long as the scutellum, abruptly turned downward at apex, forming a hook; cilia on anterior wings rather long, much longer than in *angustula*; length of abdomen 74; length of second tergite 34, width 27; greatest thickness of abdomen 8; black; scape and legs, except coxae, yellowish-brown; posterior femora infuscated.

Type locality.—Washington, D. C.

Described from one specimen collected by the author, September 24, 1923.

This species and *angustula* approach the forms one would expect to find in *Piestopleura*.

***Leptacis carinator*, new species.**

Female.—Length, 1.13 mm. Runs to *pennsylvanica* in the author's key (Fouts, 1924, p. 117). Length of head 15, width 26; frons shining, traversed by a number of distinct carinae much as may be found in *Platygaster vernalis* Myers although with fewer carinae than in that species. There is scarcely any further difference between this species and *pennsylvanica*. Length of thorax 41, width 21, height 30; length of abdomen 48; length of second tergite 32, width 23; following segments polished, without pubescence; last tergite subopaque, with a delicate sculpture.

Type-locality.—Brownwood, Texas.

Described from one specimen collected by the author, May 1, 1924, in Pecan Bayou.

***Leptacis dubiosa*, new species.**

Male.—Length, 1.85 mm. Runs to *floridana* in the author's key (Fouts, 1924, p. 135). Length of head 21, width 36; head entirely finely shagreened; antennae densely pubescent, the hairs nearly as long as the joints are wide; fourth joint a little over twice as long as wide, more or less spindle-shaped, a little wider than the pedicel; eighth and ninth joints about twice as long as wide; length of thorax 75, width 30, height 33; anterior wings very nearly glabrous, without marginal cilia; length of abdomen 75; length of second tergite 40, width 28; length of third tergite 8; tergites four to six subequal, about as long as the third; last tergite very short, not half as long as the sixth; tergites three to seven delicately shagreened.

Type-locality.—Brownwood, Texas.

Described from one specimen collected by the author, May 1, 1924, in Pecan Bayou.

***Leptacis abdinator*, new species.**

Female.—Length, 1.27 mm. Runs to *punctata* in the author's key (Fouts, 1924, p. 117). The abdomen in this species is distinctly longer than the head and thorax united. Length of head 16, width 28; head dully shining, reticulate; ocellocular line nearly as great as the interocellar; seventh antennal joint a little longer than wide, slightly longer than joint eight; joints eight and nine quadrate; ten longer than nine, less than twice as long as wide, subacute apically;

length of thorax 37, width 24, height 25; length of anterior wing 87; length of abdomen 65; width of second tergite 26; length of second tergite 26, of the third 5, of the fourth 10, of the fifth 12, and of the sixth 10; tergites three to six shagreened, the third and sixth less strongly so; sixth tergite triangular, acute apically; black; scape yellowish basally; legs brown to yellowish-brown in greater part; last joint of each tarsus black.

Type-locality.—Brownwood, Texas.

Described from one specimen collected by the author, June 15, 1924, in Pecan Bayou.

***Leptacis texana*, new species.**

Male.—Length 1.33 mm. Runs to *aciculata* in the author's key (Fouts, 1924, p. 118). The second tergite in *aciculata* is distinctly longer than wide and is faintly shagreened in a narrow band apically. In *texana*, on the contrary, the second tergite is about as wide as long and is not distinctly sculptured. Sculpture of the body, with the exception noted above, as in *aciculata*. Length of head 20, width 40; lengths of antennal joints in millimeters: .281, .059, .033, .109, .062, .090, .084, .086, .086, .103; widths of the same joints as follows: .039, .035, .031, .033, .029, .037, .039, .039, .039, .031; hairs on flagellar joints scattered, long; length of thorax 55, width 36, height 38; mesonotum and scutellum as in *aciculata*; length of abdomen 48; length of second tergite 37, width 37; black, trochanters, tibiae basally, and tarsi, except the last joint of each, brown; legs otherwise dark brown to black.

Type-locality.—Brownwood, Texas.

Described from eight specimens collected by the author, April 21, 1924, in Pecan Bayou.

The following note was made at the time the specimens were collected: Flying in sunshine at tips of twigs; tree about seven feet high, two inches in diameter; bark smooth; leaves alternate.

Paratypes.—Cat. No. 28119, U. S. N. M. Four specimens.

Family DIAPRIIDAE.

***Idiotypa pallipes*, new species.**

Female.—Length, 1.56 mm. Length of head 26, width 35, height 29; scape as long as the two following joints united, about twice as long as wide; about as wide as the seventh joint; third joint as wide but longer than the fourth; joints four to seven subequal in length and width, about as wide as long; eighth joint a little wider and longer, spherical; following four joints much wider, transverse, the eighth joint the narrowest; last joint conical, a little longer than wide; length of thorax 48, width 38, height 31; scutellum with one fairly large fovea basally and one smaller one on each side of it; length of abdomen 70; height 28; first segment a little longer than wide, with a number of longitudinal ridges dorsally and laterally; length of second tergite 50, width 37; second tergite with three short sulci basally; wings hyaline; venation as in *pallida* Ashm.; black; basal four antennal joints brown; legs, except last joint of tarsi, pale yellow; middle femora infuscated above.

Type-locality.—McLean, New York.

Described from one specimen sent to me by Mr. M. D. Leonard of Cornell University for determination. This specimen was collected by Professor C. R. Crosby, June 21, 1924, from spider material by sifting.

Family SCELIONIDAE.

Hoplogryon coxalis, new species.

Female.—Length, 1.0 mm. Differs from *claripennis* Ashm., in having the wings tinged with brown. Length of head 18, width 34; frons polished, with a delicate median carina below; malar area striate; occiput delicately shagreened; third antennal joint distinctly longer than the second or fourth, nearly twice as long as wide; joints two, three, and four subequal in width, the second and fourth of about the same length; club joints closely united, transverse; last joint about as long as wide, conical, blunt at apex; length of thorax 33, width 31, height 30; mesonotum obscurely delicately sculptured, pubescent; scutellum polished; anterior wings brownish, with long cilia; length of abdomen 50; abdomen egg-shaped, strongly convex above; first and second tergites with many deep longitudinal grooves, those on the second tergite extending to the apical third of the segment; length of third tergite 22, width 32; third tergite shining, very delicately reticulate; fourth tergite finely shagreened at base, black; scape at base, mandibles, and all legs in greater part, yellow; antennae piceous; anterior femora in greater part, middle and posterior femora at extreme apex, and all tibiae and tarsi, brownish.

Type-locality.—Suffern, New York.

Described from one specimen collected by C. R. Crosby, May 26, 1924.

A NEW SPECIES OF LEPTOSTYLUS FROM THE UNITED STATES
(COLEOPTERA: CERAMBYCIDAE).

By W. S. FISHER, U. S. Bureau of Entomology.

Leptostylus knulli, new species.

Form similar to *Leptostylus tuberculatus* Fröl., uniformly pale reddish-brown, rather densely clothed with cinereous and brownish-yellow recumbent pubescence, the pronotum with a few more or less distinct darker areas, and clytra ornated with irregularly placed tufts of long black or yellowish-white hairs, and with an elongate black area along the lateral margins; mandibles reddish-black; palpi brown, with the tips slightly paler.

Head quadrate in front of antennal tubercles, slightly convex, rather deeply angularly depressed between the antennal tubercles, which are moderately developed but not widely separated at the base, the surface finely, densely punctate, rather densely clothed with moderately long recumbent brownish and yellowish-white pubescence, more or less mottled, not quite concealing the punctuation, and with a narrow longitudinal groove extending from the epistoma to occiput; eyes rather large, moderately granulated, deeply emarginate, and separated from each other on the top by about the width of the emargination

of the eyes in front, the lower lobes rounded and rather strongly convex, and the upper lobes smaller and narrow. Antennae slightly longer than the body, mottled with short whitish and brownish pubescence, and the outer joints more or less annulated with brown at base and apex; first joint slender, cylindrical, gradually expanded toward apex, extending nearly to base of pronotum, and subequal in length to the third joint, which is only slightly longer than the fourth.

Pronotum about three-fifths wider than long, and the apex and base about equal in width; sides feebly constricted near base, and with a more or less distinct obtuse tubercle placed slightly behind the middle; surface feebly transversely depressed along base and anterior margin, with five more or less distinct obtuse tubercles on the disk, placed transversely in two rows, two anteriorly and three posteriorly, rather coarsely and densely punctate, rather densely clothed with brownish-white pubescence, and ornated on each side behind the lateral tubercle with a blackish area, and a similar colored longitudinal vitta on each side of the middle, the vittae extending from lateral margin to base and more or less broadly interrupted on disk. Scutellum triangular, slightly broader than long, and broadly rounded or subtruncate at apex.

Elytra not quite two times as long as wide, and about one-half wider than pronotum at base; humeri prominent and rather strongly elevated; sides nearly parallel to apical third, then strongly arcuately attenuate to the tips, which are obliquely truncate internally, obsoletely arcuately emarginate, and with the exterior angles obtuse; surface more or less uneven, with a broad transverse depression on disk at basal third, with numerous irregularly placed tubercles, and with the sides abruptly declivous and more or less longitudinally concave, coarsely and rather densely punctate, rather densely clothed with cinereous and brownish-yellow pubescence, and with tufts of longer black or yellowish-white hairs on the tubercles, and each elytron with a longitudinal black vitta along the lateral margin extending from the humerus to near the tips of the elytron, with a more or less distinct black oblique fascia at apical third, in front of which the pubescence is slightly more cinereous.

Beneath finely, densely punctate, not very densely clothed with brownish and yellowish-white pubescence, which gives the surface a more or less mottled appearance, and sometimes the tibiae at apex, and tarsi of a darker brown color; last abdominal segment broadly rounded and feebly emarginate in the male, and longer and more acutely rounded in the female; prosternal process about one-half as wide as the coxal cavity; femora very strongly and abruptly clavate at apex.

Length, 7.5-10 mm.; width, 3.2-4 mm.

Type locality.—Dorchester County (near Lloyds), Maryland.

Other localities.—Piney Point, Maryland; Oak Grove, Alabama; and Hope, Arkansas.

Type, allotype and paratypes.—Cat. No. 27918, U. S. N. M.

Paratypes.—Collection J. N. Knull.

Described from seven specimens, three males and four females. The type (male), allotype, and one female paratype collected at the type locality, July 10, 1907, by H. S. Barber; one male paratype from Piney Point, Maryland (Hubbard and Schwarz); one

female paratype collected at Oak Grove, Alabama, June 17, 1893 (H. Soltan Coll.); and a male and female paratype received from J. N. Knull, which were collected at Hope, Arkansas, June 5, 1922, by Louise Knobel.

The dark markings in this species are more or less variable, in some specimens the two black vittae on the pronotum are nearly obsolete, and the tufts of black hairs on the elytra are mostly replaced by tufts of yellowish-white hairs.

This species is allied to *terraecolor* Horn, but in that species the pubescence is more ochraceous, without the longer tufts of black hairs on the elytra, sides of pronotum arcuately rounded without a distinct lateral tubercle, antennae longer, and the elytra without the longitudinal black vittae along the lateral margins.

A NEW CUBAN TERMITE.

By T. E. SNYDER, U. S. Bureau of Entomology.

Dr. Barbour and Mr. Brooks recently collected a new termite in Cuba. It is characterized by dark antennae, rather narrow nasus, and short points to the mandibles.

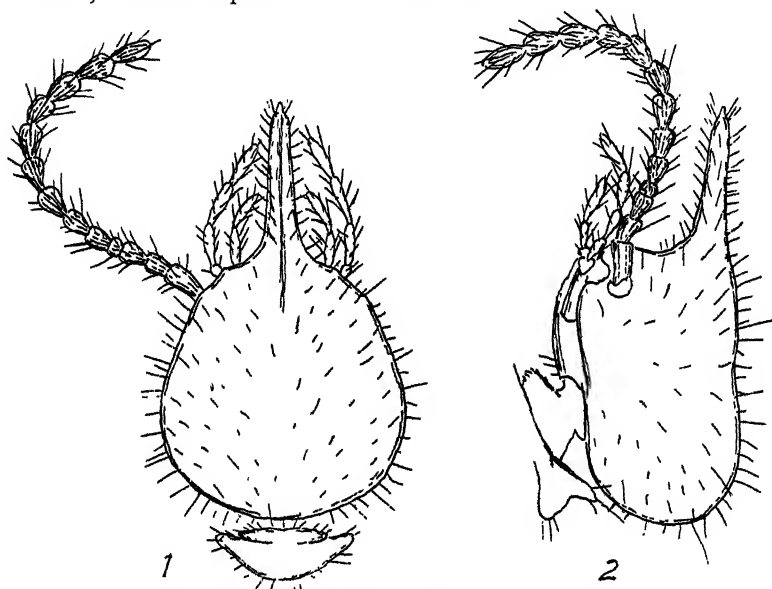


Fig. 1. *Nasutitermes (Tenuirostritermes) brooksi*. Dorsal view of head and pronotum.

Fig. 2. *Nasutitermes (Tenuirostritermes) brooksi*. Lateral view of head and pronotum.

Drawings by Miss E. T. Armstrong.

Nasutitermes (Tenuirostritermes) brooksi, new species.

Soldier.—Head light yellow-brown (light castaneous), lighter colored posteriorly; widest posteriorly, narrowed anteriorly, slightly constricted at about middle, slightly convex in profile except for depression at middle; with dense fairly long hairs, and longer hairs on the anterior and posterior portions; a small process on front of head between antennae and nasus. Nasus reddish-brown to blackish, elongate, slender, conical, with dense fairly long hairs. Mandibles with sharp points, but points fairly short.

Antenna grey-brown, with 12-13 segments, segments relatively short, with long hairs; second and third segments approximately equal (subequal); when 13 segmented, fourth segment short and ring-like; when 12 segmented, fourth segment approximately as long as or longer than third and broader; fifth segment longer; segments become longer and broader towards apex; last segment slender and sub-elliptical.

Pronotum light yellow-brown, darker anteriorly; saddle-shaped, anterior margin high, rounded, slightly emarginate, posterior margin rounded, emarginate with short and long hairs.

Legs yellowish, fairly elongate and slender, with long hairs.

Abdomen grey-brown, with dense fairly long hairs, a row of longer hairs at the base of each tergite; cerci fairly prominent.

Measurements:

Length of entire soldier: 2.20 mm.

Length of head with nasus: 1.10 mm.

Length of head to anterior: 0.70 mm.

Length of nasus: 0.40 mm.

Length of pronotum: 0.20 mm.

Length of hind tibia: 0.90 mm.

Width of head (at posterior, where widest): 0.65 mm.

Width of head (at anterior, where narrowest): 0.45 mm.

Width of pronotum: 0.35 mm.

The soldier of *T. brooksi* Snyder, though smaller, is similar in size and shape to *Obtusitermes aequalis* Snyder from Cuba, but is darker and has one more segment to the antennae and has points to the mandibles; *O. aequalis* may be a *Tenuirostritermes*.

Post-clypeus of worker dirty white with tinge of yellow, about one-half as long as broad, arched, with long hairs.

Type locality.—Soledad, Cienfuegos, Cuba.

Described from a series of soldiers and workers collected by Dr. T. Barbour and Mr. Winthrop Sprague Brooks at the type locality, under stone?, in April, 1924. Named in honor of Mr. Brooks of the Boston Society of Natural History.

Type, soldier.—Cat. No. 15067, Museum of Comparative Zoology, Cambridge, Mass. Paratype in U. S. N. M.

SOME AMERICAN SYRPHIDAE (DIPTERA).

BY RAYMOND C. SHANNON, U. S. Bureau of Entomology.

A number of species of Syrphidae of various genera from North, Central and South American countries are here described.

Chrysogaster ithaca, new species.

The present species is of special interest as it is our first eastern United States form belonging to a group of Pacific Coast species, the original members of which were described under the genus *Chilosia*. It bears a strong superficial resemblance to *Chilosia comosa* Loew.

Male.—Head large, broader than high; ocellar triangle slightly protuberant, black pilose; frontal triangle somewhat inflated with sparse black pile; antenna very small, brownish, above middle of head; arista equal to half the width of the face, measured across middle; face broad, but much higher than broad; with a small rugulose patch on each side and a small central tubercle; thoracic dorsum with fairly long, black pile, nearly erect, directed slightly backward; wings with yellowish brown tinge; apical crossvein directed outward, its extreme tip turned upward; petiole beyond first posterior cell but little longer than discal crossvein; penultimate section of fifth vein straight; petiole beyond anal cell noticeably shorter than in *nigripes*, evanescent at tip; squamae smoky, halteres yellowish; outer styles broad.

Type-locality.—Ithaca, New York, June (R. C. Shannon).

Type.—Cat. No. 27815, U. S. N. M.

C. nigripes differs by having the antennae placed at middle of head; a much larger frontal triangle; longer petioles beyond first posterior and anal cells; and the penultimate section of fifth vein distinctly bowed downward. *C. versipellis* has the face and frontal triangle more sharply convergent above; the frontal triangle distinctly smaller; outer styles much narrower.

Chrysogaster neotropica, new species.

Belongs to *nitida* group: first two tarsal joints bright yellow; antennae elongate; apical crossvein rectangular; stigma about as long as distance between the tips of second and third vein; mesonotum coppery vittate.

Female.—Linear markings of eye extremely labyrinthine; transverse marking nearly obsolete; antennae reddish yellow, moderately elongate, not as long as width of face at antennal base; first joint very short; second subequal to third; six mesonotal stripes, the lateral ones inconspicuous; scutellum subquadrate; legs bluish black with bases and apices of tibiae and the two basal tarsal joints yellow (three on hind tarsus); abdomen broad and flat, the disc subopaque; wings hyaline with dark spots as follows: just beyond middle of marginal cell; at tip of second vein and extending across to tip and along the apical crossvein at tip of submarginal cell; on discal and posterior crossveins and middle of discal cell. Length, 5 mm., wing, 3.75 mm.

Type-locality.—San Bernardino, Paraguay (K. Fieber).

Type.—Cat. No. 27814, U. S. N. M.

Tribe MYIOLEPTINI, *sensu stricto*.

The genus *Myiolepta* Newman (1838) was established for *Musca luteola* Gmelin, a European species. Twelve American species have been described under the name *Myiolepta*.

The writer, in his revised key to the American genera of Syrphidae (1921) erected the genus *Eumyiolepta* for *Myiolepta strigilata* Loew. In a later paper (1922) he called attention to the fact that *Lepidostola* Mik. (1886) was a member of the Myioleptini (previously associated with *Chrysogaster*) and gave a key to the three genera of the tribe.

Another species has come to hand which typifies a fourth genus of Myioleptini.

KEY TO THE GENERA OF MYIOLEPTINI.

- A1. Face concave or flat, with tubercle in male; metasternum membranous behind.
 - B1. Body pile normal, composed of small hairs *Myiolepta* Newman.
 - B2. Body pile modified, scale-like.
 - C1. Antenna moderate, second and third joints as broad as long.....
Eumyiolepta Shannon.
 - C2. Antenna much elongated, second and third joints much longer than broad *Lepidostola* Mik.
- A2. Face with strong carina; metasternum girdled with a chitinous band; thorax without tomentum..... *Zonemyia*, new genus.

Probably all of the tropical species described under *Myiolepta* will be found to belong to genera other than *Myiolepta*, *sensu stricto*.

Lepidostola has also been recorded under *Lepidomyia decessum* Hutton by Miller (Trans. New Zealand Institute, LIII, 294, 1921), from New Zealand. The writer has seen specimens of this species in Mr. W. M. Davidson's collection. It belongs to the genus *Psiloia*.

Lepidostola jenningsi, new species.

A remarkable species, peculiarized by the thorn-shaped scutellum.

Male.—Head flat in appearance, not much broader than high; ocellar triangle small, strongly protuberant, shining black; frontal triangle pollinose at apex, and lower corners shining black and bare above antennae; face broad, narrowing a little below, flat in profile with small median tubercle, mainly shining black through middle, densely pollinose on sides; antenna yellowish brown, slender, very elongate, nearly equal to height of head, first joint more than twice as long as broad, subequal to second, the third longer than first two together; arista much shorter than third joint; mesonotum with very short black pile on disc with scattered yellow scales intermixed; anterior margin of mesonotum with broad band of yellow tomentum; band of yellow tomentum behind transverse

suture broadly interrupted in middle; posterior margin with yellow tomentose band which extends forward on sides nearly to suture; scutellum with short stiff yellowish and black hairs, produced behind to a sharp point, in general appearance like that of a very stout thorn, or a nearly equilateral triangle; pleurae shining black with a very few widely scattered whitish scales; femora stout, strongly spinose below, black with the bases sharply yellowed, apices briefly yellow; tibia black with yellow bases; tarsi yellow, last two joints in all cases black; second and third abdominal tergites subopaque black with shining metallic lateral margins and the third with broad band of dark metallic coloration; fourth tergite shining bronze with scattered white scales; wings hyaline; discal crossvein near base of discal cell; first posterior cell with very short petiole beyond; spurious vein absent; squamae white, halteres yellowish. Length, 6.5 mm., wing, 5 mm.

Type-locality.—Canal Zone, Panama (A. H. Jennings).

Type.—Cat. No. 27856, U. S. N. M.

The specimen was evidently reared as the pin also bears three puparia. No rearing data is available, however. Mr. C. T. Greene states that the puparia greatly resemble the *Myiolepta* type which is added proof of the relationship of *Lepidostola* to *Myiolepta*. The head greatly resembles that of the *Chrysogastera* as claimed by Williston, but this seemingly is a coincidence.

ZONEMYIA, new genus.

Face with a deep cavity below antennae, which is directly raised to a strong keel which continues to oral margin; thorax without tomentum, the usual pile extremely reduced, apparently absent; anterior margin of mesonotum armed with a transverse row of short, stout black spines (always?); metasternum with a band of chitin extending clear across its posterior surface.

Genotype.—*Zonemyia spinosa*, new species.

Zonemyia spinosa, new species.

Male.—Head very broadly elliptical; ocellar triangle very large, blackish in vicinity of the ocelli but yellowish pollinose before and behind; eyes narrowly separated; frontal triangle and face, except carina and jowls, densely golden pollinose; face with fairly deep but short concavity below antennae then raised to a strong straight keel which extends to oral margin; upper posterior rim of head armed with short stout black spines; mesonotum black with numerous minute hair tubercles bearing minute hairs; three golden pollinose transverse stripes, the anterior pair placed before middle of thorax, interrupted in middle; posterior one in front of scutellum; a row of short stout spines along anterior margin of first transverse stripe; the second one extending well onto the pleurae; scutellum yellow pollinose; fore and mid femora slightly swollen, the anterior pair simple, mid pair with few small ventral spines; hind femur much swollen, spinose on ventral surface; tibiae reddish brown, fore pair darkened apically; fore tarsi enlarged (as in *Temnostoma* and *Sphecomomyia pattoni*) black; mid and hind tarsi normal, yellowish; abdomen very insignificantly pilose; constricted at second and third segments, second tergite with pair of shining brassy spots;

third and fourth tergites brassy on sides, subopaque medianly, with pale short pile; wings smoky; petiole beyond first posterior cell nearly as long as discal crossvein; apical crossvein angulated. Length, 7.75 mm., wing 5.5 mm.

Female.—Front variegated golden and blackish pollinose, at vertex equal to length of third joint; at antennal base slightly longer than length of antennae.

Type-locality.—Trinidad River, Panama.

Type.—Cat. No. 27828, U. S. N. M.

Holotype male and allotype female, June 2, 1911 (A. Busck).

Another male specimen, Trinidad River, Panama, June 5, 1911 (A. Busck) differs a little in color from the above. The scutellum has very little trace of golden pollinosity and the second tergite has a pair of elongate yellow spots.

Myioleptia transversa Hine evidently belongs to *Zonemyia*. It differs from *spinosa* principally in having patches of dense golden tomentum on the abdomen.

Genus **QUICHUANA** Knab.

Quichana Knab, Ins. Ins. Mens, I, 13, 1913.

Two species were included in this genus at the time of its erection: *sylicola* Knab, genotype, and *picadoi* Knab and Knab further stated that *Mallota championi* Williston probably belonged here, too. Two additional species are at hand and a synoptic key is given for the group.

- A1. Arista much shorter than antenna; hind margins of second and third tergites yellow. (Peru)..... *inca*, new species.
- A2. Arista as long as antenna; abdomen not bicolored.
 - B1. Abdomen shining metallic bronze. (Mexico)..... *championi* Williston.
 - B2. Abdomen shining black.
 - C1. Anterior margin of wing distinctly infuscated; no stigmatic crossvein. (Panama)..... *calathea*, new species.
 - C2. Anterior margin of the wing hyaline or nearly so; stigmatal crossvein present.
 - D1. Face broader than length of arista. (Peru) .. *sylicola* Knab.
 - D2. Face a little narrower than length of arista. (Costa Rica)..... *picadoi* Knab.

Quichana inca, new species.

Male.—Head broadly elliptical; ocellar triangle normal with rather long black pile; eyes contiguous; frons rather large with long black pile and with short yellow pile along eye margins; antenna elongate, slender, much longer than arista and width of face; second joint twice as long as first and nearly as long as second; face shining black with four narrow pollinose stripes extending down from antennae, the lateral ones extending to eye margins, the median ones to oral margin and thence to eye margin and turning upwards along the eye margins they meet the lateral stripes, thus forming an elongate pear-shaped outline; facial pile fairly long, pale; mesonotum dark, a pair of pale pollinose stripes, fading posteriorly; pile short and yellowish with longer black hairs intermixed; scutellum brownish, crescent-shaped, nearly three times as broad as long; femora

black, reddish brown apically; tibiae and tarsi reddish brown; hind femora greatly enlarged; abdomen chiefly black, narrow, slightly constricted subbasally; first tergite with matted yellow hairs; second and third tergites bordered behind with yellow pollinosity; wings infuscated anteriorly; stigmatal crossveins present; squamae darkly tinged, cilia brownish; halteres reddish brown. Length, 9 mm., wing, 7 mm.

Type-locality.—Huascaray, Peru. One male September 21 (C. H. T. Townsend).

Type.—Cat. No. 27829, U. S. N. M.

***Quichana calathea*, new species.**

Male.—Orbits with yellow pile; ocellar triangle black pilose; frons with coarse bright yellow pile; antenna moderately elongate, slightly shorter than arista, third joint nearly as long as first two combined; arista longer than width of face; face whitish pollinose with fairly dense whitish pile; mesonotum dark with four whitish stripes; pile yellow, fairly long, a dense patch of yellow pile on notopleura which extends onto mesopleura; legs blackish to reddish brown; hind femur moderately enlarged; abdomen entirely shining black, broadest basally; clothed with yellow pile, mat-like on first tergite; wings with a large white spot apically, strongly infuscated anteriorly and basad of the white spot; stigmatal crossvein absent. Length: 10 mm., wing, 8.5 mm.

Female.—Front rather narrow; pile everywhere darker, apex of wing usually without white spot.

Type-locality.—Porto Bello, Panama.

Type.—Cat. No. 27830, U. S. N. M.

Ten specimens were reared from the water and material in the flower bracts of a large species of *Calathea*, August 28, 1923 (R. C. Shannon).

***Mixogaster rarior*, new species.**

Male.—Head broader than its height by nearly the width of an eye, broadly elliptical; eyes widely separated, the front slightly widening upwards; distinctly longer than broad; a transverse impression midway of ocelli and antennae; a yellow spot behind ocelli and a yellow transverse stripe below ocelli; antennae dark brown, shorter than length of face; first joint as long as following two, the second about one-third of first; first joint slender, following two thickened; arista paler, a little longer than third joint; face bright yellow, clothed with scattered pile; nearly three times as high as broad, straight in profile with gentle slopes; a small shining black tubercle a short distance below antennae; dorsum of thorax dark brown bordered completely, except on anterior margin between humeri, by a yellow stripe which includes scutellum; pleurae yellowish; legs dark reddish brown, bases of tibiae yellow; abdomen greatly constricted basally, the third and fourth segments of normal width, dark reddish brown color, paler on basal two-thirds and post margin of second and post margin of third tergites; wings infuscated anteriorly; a spur extending upwards from tip of fifth vein into first posterior cell; apical crossvein twice angulated, and with spurs at each angle also at the base of apical crossvein (four spurs in all). Length, 9 mm., wing, 6 mm.

Female.—Front and vertex subquadrate, a little longer than broad; length, 11 mm., wing, 9.5 mm.

Type-locality.—Taboga Island, Panama.

Type.—Cat. No. 27831, U. S. N. M.

Holotype male, paratype male, February 23; allotype female, February 26, 1924 (A. Busck).

Mixogaster dimidiata Giglis-Tos (Mexico) is apparently the closest related species to the above but it is distinguished by its extraordinary arcuate face. *M. mexicana* also is closely allied. It may be distinguished by its yellow antennae and lack of yellow lateral mesonotal border.

***Mixogaster rarior rarissimus*, new variety.**

Male.—Differs from the male of the above by its larger size, 11 mm., vertex behind ocelli uniformly reddish brown; a median brownish stripe extending from oral margin to faint tubercle below antennae; only the spur at the tip of the fifth vein present.

Type-locality.—Cacao Trece Aguas, Alta Vera Paz, Guatemala, March 28, 1906 (Schwarz & Barber).

Type.—Cat. No. 27832, U. S. N. M.

***Microdon micromidas*, new species.**

Female.—Small species of a general yellowish appearance. Head as broad as high; ocellar triangle protuberant; front black, with scant bright yellow appressed pile; front narrowed somewhat above; antennae yellowish brown, shorter than face, first joint twice as long as broad, the second much smaller than the first, the third nearly three times as long as first; face yellowish, narrowing below, evenly clothed with bright yellow pile; dorsum of thorax noticeably smaller than frontal aspect of head, brassy black, with golden pile; pleurae dark with yellow pile; legs bright yellow, the hind legs with the apical half and first two tarsal joints black and with black pile; abdomen yellow with diffuse dark markings at the middle, clothed with yellow pile; wings with a distinct yellowish tinge, darkened apically.

Type-locality.—Taboga Island, Panama, February 21, 1911 (A. Busck).

Type.—Cat. No. 27833, U. S. N. M.

This species is closely related to *Microdon wheeleri* Mann which differs by having the first antennal joint as long as the third; a broad median stripe of the face shining and bare; dorsum of thorax larger than frontal aspect of head and nearly entirely yellow in color with a transverse band of black pile behind suture; legs entirely yellow (apical half of hind tibia and tarsi with black pile).

Micromidas shows several strong points of relationship with *Microdon (Masarygus) megacephalus* chiefly in the large head and small thorax and color and pilosity of the hind legs. Perhaps the three species discussed here will eventually be shown to be a closely related group.

THE HISTORY OF THE RYNCHOPHORID GENERA RYNCHOPHORUS, CALENDRA, SPENOPHORUS AND SITOPHILUS (COLEOPTERA).

BY W. DWIGHT PIERCE, *Banning, California.*

I have been asked by Mr. A. F. Satterthwait to elucidate in full my studies of the genotypes of the important genera of the grain weevils, and the corn root weevils. The following notes are extracted from my manuscript on the generic nomenclature of the Rhynchophora, which is based on personal study of practically all the original publications in the group.

I will trace step by step the citations which may have a direct bearing on type fixation in the genera concerned.

CURCULIO Linnaeus, 1758, Syst. Nat., 10th edit., pp. 377-386. Includes 80 species, no type designated. First valid designation of type by Latreille, 1810, = *nucum* Linnaeus. *Balaninus* Germar, 1817, is an isogenotype. This genus had as its first three species *palmarum*, *indus*, and *hemipterus*.

RYNCHOPHORUS Herbst, 1795, Der Käfer, vol. 6, pp. 3-429. Includes 22 species, no type designated. First designation of type by Schönherr, 1826, = *palmarum* Linnaeus.

CORDYLE Thunberg, 1797, Kongl.—Vet. Ac. Handl., vol. 18, pp. 44-49. Includes 5 species, no type designated. The first species was *palmarum* Linnaeus, and is hereby designated as type, making Cordyle an isogenotype of *Rynchophorus*.

RHYNCHOPHORUS Illiger, 1798, Verz. Käf. Preuss., pp. 497-510. Equals *Rynchophorus* Herbst, 1795.

CALENDRA Clairville-Schellenberg, 1798, Ent. Helv., pp. 62, 63. Includes 2 species, no type designated. First designation of type by Latreille, 1810, = *abbreviata* Fabricius. *Sphenophorus* Schönherr, 1838, is an isogenotype.

CALANDRA Clairville-Schellenberg, 1798, Ent. Helv., plate 2. Equals *Calendra* Clairville-Schellenberg, 1798.

CALANDRA Fabricius, 1801, Syst. Elcuth., vol. 2, pp. 429-438. Equals *Calendra* Clairville-Schellenberg, 1798.

CURCULIO Latreille, 1810, Consid. Gen. Type designation = *nucum*, (Fabricius) Linnaeus.

CALANDRA Latreille, 1810, Consid. Gen. Type designation = *abbreviata* Fabricius. Equals *Calendra* Clairville-Schellenberg, 1798.

CALANDRA Leach, 1815, Edinb. Encyc., vol. 9, Entom., pp. 106-109. Type designation = *granaria* Linnaeus. Equals *Sitophilus* Schönherr, 1838.

CALANDRA Say, 1824, Amer. Ent. Equals *Calendra* Clairville-Schellenberg, 1798.

RHYNCHOPHORUS Schönherr, 1826, Curc. Disp. Meth., pp. 23, 326. Type designation = *palmarum* (auct.) Linnaeus. Equals *Rynchophorus* Herbst, 1795.

CALANDRA Schönherr, 1826, Curc. Disp. Meth., pp. 23, 328. Type designation = *granaria* (auct.) Linnaeus. Equals *Sitophilus* Schönherr, 1838.

SPHENOPHORUS Schönherr, 1838, Gen. et Sp. Curc., vol. 4, pt. 2, p. 875.

Type designation = *abbreviata* Fabricius. Equals *Calendra* Clairville-Schellenberg, 1798.

SITOPHILUS Schönherr, 1838, Gen. et Sp. Curc., vol. 4, pt. 2, p. 968.
Type designation = *oryzae* Linnaeus.¹

The synonymy given above may be expressed briefly as follows:

CURCULIO Linnaeus, 1758, Syst. Nat., 10th edit., pp. 377-386.

type—*nucum* Linnaeus, designated by Latreille, 1810.

BALANINUS Germar, 1817, Mag. der Ent., pp. 339-341.

type—*nucum* Linnaeus, designated by Leach, 1819.

RYNCHOPHORUS Herbst, 1795, Der Käfer, vol. 6, pp. 3-429.

type—*palmarum* Linnaeus, designated by Schönherr, 1826.

CORDYLE Thunberg, 1797, Kongl. Vet. Ac. Handl., vol. 18, pp. 44-49.

type—*palmarum* Linnaeus, hereby designated.

RHYNCHOPHORUS Illiger, 1798, Verz. Käf. Preuss., pp. 497-510.

type—*palmarum* Linnaeus, designated by Schönherr, 1826.

CALENDRA Clairville-Schellenberg, 1798, Ent. Helv., pp. 62, 63.

type—*abbreviata* Fabricius, designated by Latreille, 1810.

CALANDRA Clairville-Schellenberg, 1798, Ent. Helv., plate 2.

type—*abbreviata* Fabricius, designated by Latreille, 1810.

SPHENOPHORUS Schönherr, 1838, Gen. et Sp. Curc., vol. 4, pt. 2, p. 875.

type—*abbreviata* Fabricius, designated by Schönherr, 1838.

SITOPHILUS Schönherr, 1838, Gen. et Sp. Curc., vol. 4, pt. 2, p. 968.

type—*oryzae* Linnaeus, designated by Schönherr, 1838.

CALANDRA Leach, 1815, Edinb. Encyc., vol. 9, Entom., pp. 106-109.

type—*granaria* Linnaeus, designated by Leach, 1815.

¹My attention has just been called to a point in Schönherr's work that I seem to have overlooked in my studies. It seems that Schönherr (1826, Curc. Diep. Meth. pt. 4, preface p. V) preferred to change all feminine genonyms into masculine form, and that when he proposed *Sitophilus* he intended to substitute this name for *Calandra* as he interpreted that name. We might truly consider it a pure substitution and consider his genus *Sitophilus* a pure genotypic synonym of his 1826 conception of *Calandra* if he had named the same species as his type of *Sitophilus*; but he did not do this. Instead he named another species, now considered as congeneric, but which has a morphological character of such importance that in many families the two would be separated as distinct genera. This may never occur in this group; but because future entomologists may consider the presence or absence of wings of true generic character, it is best for us to abide by what Schönherr did, rather than what he intended to do.

DESCRIPTION OF A NEW SAWFLY INJURIOUS TO JACK PINE.

By S. A. ROHWER, U. S. Bureau of Entomology.

The description of the species given below is published at this time so that the name may be available for use in a paper dealing with the life history and habits of the jack pine sawfly.

Neodiprion (Neodiprion) banksianae, new species.

Structurally this new species is very closely allied to *dyari* Rohwer but, besides certain details in sculpture and a somewhat different clypeus, it may be readily separated from *dyari* by the paler abdomen of the female and the ferruginous venter of the male. This species is also closely allied to *eximina* Rohwer, but it may be distinguished from that species by the narrower and broader postocellar area, the more finely punctured prescutum, more sparsely punctured mesepisternum, and the pale tergum.

Female.—Length 7 mm. Clypeus convex, covered with rather large irregular punctures, the apical margin slightly emarginate and narrowly depressed; middle fovea large, somewhat circular in outline, rather deep; frons coarsely, irregularly punctured; vertex and posterior orbits shining, with large scattered punctures; postocellar area convex, three times as wide as its anterior width, not depressed medianly; antenna 19-jointed, the third joint slightly longer than the fourth, the rami about equal to the length of the joints; scutum and prescutum polished but with small, separate, distinct punctures; scutellum sharply angulate anteriorly, almost truncated posteriorly, the sides with large distinct punctures; mesepisternum shining, dorsally with distinct separated punctures; tarsi normal; hind basitarsus distinctly longer than its apical width; tergites polished; sheath when seen from below with the apical margin rounded, the pad-like brush elongate and separated from the median ridge by a distance greater than one-half its width, the length of the pad subequal with the basal portion of the ridges supporting them. Ferruginous, testaceous and black; head ferruginous; frons from the bases of the antennae up to and including the ocelli (making a broad U), the vertical furrows and antennae black; prescutum except testaceous lateral margins, scutum and metanotum, black; pronotum, pleurae, base of the venter and sides of the tergites, testaceous; abdomen, except where mentioned, pale, ferruginous; coxae, trochanters, bases of tibiae testaceous; femora except the black basal part of the anterior pair, apices of tibiae and tarsi ferruginous; wings hyaline; venation dark brown, costa testaceous.

Paratype females vary in the amount of black on the frons and in some of them the U-shaped black mark is broken so as to be only a transverse black band around the ocelli and irregular spots at the bases of the antennae. In some paratypes, the posterior median portion of the scutellum is punctured, but in none of the specimens is the scutellum punctured in the anterior median portion.

Male.—Length 5.5 mm. Clypeus convex the surface with large well defined punctures, the apical margin gently arcuately emarginate and very narrowly depressed; head with large punctures which are irregularly confluent on the

frons; postocellar area not sharply defined laterally, distinctly convex; antennae 20-jointed; pronotum irregularly punctured; scutum and prescutum shining, with separate small punctures; scutellum with large close punctures which are irregularly confluent laterally; mesepisternum coarsely irregularly punctured dorsally, ventrally shining and with small scattered punctures; two basal tergites with a few large scattered punctures, remaining tergites polished; hypandrium with the apical margin broadly rounded, the surface with distinct scattered punctures. Black; clypeus, ventral aspect of tergites and all the sternites ferruginous; labrum and tegulae testaceous; apices of coxae, trochanters, base of the four anterior tibiae and four anterior tarsi, testaceous; femora, apices of the four anterior tibiae, all of the posterior tibiae and the posterior tarsi, ferruginous.

Type-locality.—Itasca Park, Minnesota.

Paratype-locality.—Osage, Minnesota.

Described from three (one type) females and two (one allotype) males from the type locality and from seven females and five males from the paratype locality. This material was reared from larvae feeding on *Pinus banksiana* by S. A. Graham and is recorded under Bureau of Entomology Nos. Hopkins U. S. 17501 and 17500 and various sub-letters. The type is recorded under No. 17501-u and the allotype under 17501-v. All of the specimens emerged during September, 1924.

Type, allotype and paratypes.—Cat. No. 28104 U. S. N. M.

Two females and three male paratypes deposited in the collections of the University of Minnesota.

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A SYNOPSIS OF NEW WORLD FLIES OF THE GENUS
SPHAEROCERA (DIPTERA: BORBORIDAE).

By J. R. MALLOCH, *U. S. Biological Survey.*

In a recent paper on *Sphaerocera* and *Aptilotus* Spuler has made use of three subgenera, dividing them on the structure of the face and shape and armature of the scutellum.¹

Unfortunately lack of access to types of two previously described species has resulted in their being assigned to wrong subgenera. Those species are *annulicornis* and *pallipes*, both described by the writer. Neither of these species have the pair of large yellowish white spots on the dorsum of the abdomen, a character made use of by Spuler in separating the subgenera, but in most specimens of *annulicornis* there are indications of a spot on middle of at least two of the tergites.

I have before me several species not in the material available to Spuler and believe that further accessions of species in this genus will either necessitate the dropping of the subgeneric groups or force us to add several others. The first alternative is my choice. Excessive multiplication of genera and subgenera has become a fad with many present-day workers and conditions in this family are no better than in many others, to say the least. It may be that subsequent and more intensive investigations into the various stages of the members of this family will serve to validate some of these so-called subgenera but I very much doubt it.

The genus *Sphaerocera* is distinguished from its allies by the absence of long bristles on scutellum and pleura, the tuberculi-form elevation of the metapleura (not previously mentioned by any author) and the complete basal and anal cells of the wing. The basal segment of the hind tarsus is always longer than the second and much thicker.

There are several species of *Sphaerocera* in which there are distinct orbital bristles, contrary to Spuler's statement. It may be of interest to record also that there are two distinct weakened portions of the costal vein, one before and one just beyond the humeral vein, in addition to the break before apex of first vein. These weak parts of costa are present and distinct in most members of the family but in certain species of

¹Pan-Pacif. Ent., Vol. 1, No. 2, p. 66, 1924.

the genus *Borborus* the one beyond the humeral vein is hardly distinguishable.

I have taken *curvipes* Latreille and *pusilla* Fallen on carrion and manure, and the North American *annulicornis* Malloch on fungi, from which I also reared the species.

I give a key for the recognition of the known New World forms, only one of which I have not seen (*scabra* Spuler).

KEY TO SPECIES.

1. Scutellum without a complete series of short wart-like tubercles across hind margin, at most with one on each side. 2.
- Scutellum flattened above, hind margin subtransverse, furnished with a regular series of seven or more short wart-like tubercles; hind tibia with a curved apical ventral spur which is at least as long as diameter of tibia; upper margin of face along lower side of antennal foveae sharply carinate; abdominal sternites large and conspicuous in both sexes. 10.
2. Abdomen without two large rounded whitish spots on dorsum, at most with a small whitish spot in middle of anterior margin of second and third visible tergites. 3.
- Abdomen with two large rounded whitish spots on dorsum which occupy about the apical third of first and second and the anterior third or more of second and third tergites, extending over about two-thirds of the entire disc from side to side, the spots apparently consisting of less heavily chitinized unpigmented integument. 7.
3. Hind tibia with a very strong curved apical ventral spur the tip of which lies against the anterior side of the basal segment of tarsus, the latter excavated at base below and with a series of flexed setulose hairs before the excavation the first one quite strong, claw-like; scutellum flattened above, hind margin almost exactly transverse. . . . *curvipes* Latreille.
- Hind tibia with or without an apical ventral spur, if this is present it is inconspicuous and the basal segment of hind tarsus not excavated basally and not armed as above; scutellum convex, hind margin not transverse. 4.
4. Face with a rounded transverse elevation below, which connects with a rather prominent rounded central vertical ridge extending upwards to base of antennae, the lower margin of antennal foveae not carinate nor distinctly differentiated; face, labrum, antennae, and legs yellow; second segment of hind tarsus as broad as long, not half as long as first. *flaviceps*, new species.
- Face with lower central portion flattened, subtriangular, the margins along lower side of antennal foveae sharply carinate; face and labrum black; second segment of hind tarsus over twice as long as broad and over half as long as first except in *annulicornis*. 5.
5. Legs largely black, trochanters, extreme apices of femora, bases and apices of tibiae, and most of fore and mid tarsi yellowish; second segment of hind tarsus not twice as long as broad. *annulicornis* Malloch.
- Legs including coxae yellow; second segment of hind tarsus over twice as long as broad. 6.

6. Elevated lower portion of face forming a rather small triangle, the antennal foveae therefore very broad, allowing the antennae to droop quite conspicuously..... *flavicoxa*, new species.
- Elevated portion of face very large, the antennal foveae narrow, causing the antennae to be directed straight laterad. *pallipes* Malloch.
7. Legs including fore coxae yellow, apices of femora, the tibiae, and tarsi more rufous or pale brownish; hind tibia with a short but stout black or fuscous spur at apex on anteroventral side; only two chitinous ventral plates in female abdomen..... *bimaculata* Williston.
- Legs largely fuscous, fore coxae black except at extreme apices; hind tibia without a distinguishable apical spur8.
8. Legs yellow, femora sharply bicolored, basal half black, apical half yellow, tips of hind pair more rufous or brownish; only two chitinous ventral plates in female..... *varipes*, new species.
- Legs more largely infuscated, all femora black, becoming yellowish at apices.....9.
9. Venter of female with two chitinous black plates, on first and fourth segments; cheeks closely striate in middle *striata*, new species.
- Venter of female with three chitinous black plates, on first, third, and fourth segments; cheeks not striate in middle . . . *nigrifemur*, new species.
10. Legs entirely black; inner cross-vein distinctly before basal third of discal cell; scutellum with very strong marginal tubercles; notum with four distinct rows of tubercles; disc of scutellum tuberculate; front with two divergent rows of minute tubercles *scabra* Spuler.
- Legs varying from almost entirely yellow to black, with coxae, trochanters and knees yellow; notum without distinct tuberculate rows; marginal tubercles on scutellum less pronounced; inner cross-vein at or slightly beyond basal third of discal cell. *pusilla* Fallen.

N. B.—The characters under caption 10 are copied from Spuler's Key as I do not have specimens of *scabra*.

***Sphaerocera curvipes* Latreille.**

A common species in Europe and North America and the largest of the genus known from this country, averaging about 4 mm. in length. The second costal division is less than three times as long as third, and despite Spuler's statement the scutellum is not smooth on dorsum but has short stubby spines that look wart-like under a high power lens, and on each postero-lateral angle there is at least one stout short spine that resembles a short tubercle.

This is the species usually referred to as *subsultans* Fabricius, but the latter is not a member of this family, being the same as *Hypocera mordellaria* Fallen according to those who have examined the type specimen.

Recorded from Washington, California, Illinois, Missouri, Pennsylvania, Vermont, Massachusetts, District of Columbia, and New Jersey.

Sphaerocera flaviceps, new species.

Male and Female.—Black, shining, antennae, face, labrum, most of proboscis, legs, and halteres yellow.

Face transversely roundly elevated on lower half, the swelling connecting with a rounded vertical ridge descending from bases of antennae; each frontal orbit with two short outwardly curved black bristles; vibrissal angle with two black bristles; labrum not as high as width of third antennal segment. Scutellum more flattened on disc than in *bimaculata* and its closest allies, but not so flat as in *curvipes*, hind margin very broadly rounded, the pair of tubercles very small. Fourth visible tergite in male very short, hypopygium large, bulbous. Fore and hind femora swollen in both sexes, less noticeably so in female; hind tibia with three short fine black apical bristles; second segment of hind tarsus not longer than broad and not over half as long as first. Second costal division not three times as long as third; fifth vein not reaching margin of wing.

Length, 2.5 mm.

Habitat.—Type, male, and allotype, Higuito, San Mateo, Costa Rica (P. Schild).

Type.—Cat. No. 27694, U. S. N. M.

This species does not fit well into any of the subgenera accepted by Spuler but has affinities more with *curvipes* than with any of the other species.

Sphaerocera annulicornis Malloch.

A common species in the eastern United States, distinguished readily from its allies by the characters listed in the key.

Originally described from Massachusetts, the type being in the National Museum. I have before me specimens from Plummer's Island, Maryland, September 15, 1907 (A. K. Fisher, W. L. McAtee), and August 27, 1922, reared from fungus under a stone (J. R. Malloch); Chain Bridge, Virginia, September 4, 11, and 18, 1922 (J. R. Malloch); Maywood, Virginia, January 2, 1916 (W. L. McAtee); Glen Echo, Maryland, August 21, 1921 (J. R. Malloch); and Rock Creek, District of Columbia, November 4, 1924 (H. S. Barber).

Sphaerocera flavicoxa, new species.

Male and female.—Black, shining, antennae, palpi, part of proboscis, legs including coxae, and the halteres yellow. Abdomen with a small white area at base of third visible tergite. Wings clear.

Each orbit with two very short black outwardly curved bristles on upper half, interfrontalia bare; cheek glossy and smooth in center; facial triangle small, sides subequal, upper margins slightly carinate, approaching lower margin within half the width of third antennal segment in vertical line with base of latter so that the antennal foveae are very much widened from inner to outer extremities; labrum not as high as width of third antennal segment; only one bristle on vibrissal angle, the usual hairs subobsolete, sometimes one notice-

able. Mesonotum with 4 series of microscopic decumbent hairs which are very difficult to distinguish even under a very high power; scutellum convex, almost evenly rounded on margin, and with a very minute marginal wart on each side about midway from middle to base. Abdomen in female with three small round chitinized ventral plates besides the large one on fourth visible tergite. Basal segment of hind tarsus not as long as next two combined, second about three times as long as wide; hind tibia with three short apical bristles, less distinct in the male. Anal cell exceeding length of basal by about length of the vein closing latter; fourth vein slightly curved forward, the cell in front of it narrower at apex than at middle; second costal division about four times as long as third.

Length, 2-2.5 mm.

Habitat.—Type, male, allotype, and 19 paratypes, Higuito, San Mateo, Costa Rica (P. Schild); two paratypes Petropolis, Brazil (P. Borgmeier).

Type.—Cat. No. 27693, U. S. N. M.

Sphaerocera pallipes Malloch.

I have reexamined the type specimen of this species which is in the National Museum. The face is sharply carinate along the lower margin of facial foveae and these are much higher on the face than in the preceding species which it resembles quite closely. This species fits very well into the group *bimaculata* except for the lack of dorsal abdominal spots, while the preceding one is more clearly intermediate between that group and *curvipes*.

Originally described from Panama. I have seen a very large series of both sexes of this species collected in the Panama Canal Zone in July, 1923, by R. C. Shannon and now in the National Museum. In some specimens there is a slight reddish darkening of the tips of femora as is the rule in *bimaculata*.

Sphaerocera bimaculata Williston.

I have not seen the type of this species but assign to it the form in which the legs are entirely yellow with but a slight rufous or brownish tinge on certain parts.

Originally described from St. Vincent. Spuler records it from Florida, Trinidad, and Costa Rica. I have seen specimens from Cordoba, Mexico, and Higuito, San Mateo, Costa Rica. I have seen no Florida specimens of this species, the most closely related form from that State available to me being *striata* described in this paper.

Sphaerocera varipes, new species.

Female.—The outstanding characters distinguishing this species from *bimaculata* lie in the color of the legs and absence of a black, stout, hind tibial spur

as stated in the key. The color of the femora is very distinctive, and in some specimens which have the apical part of hind femora blackened they present the appearance of having a yellow preapical band very different from that of any other species. The face is similar to that of *bimaculata*, the tubercle on each side of scutellar margin is quite noticeable in some specimens, less obvious in others. The first posterior cell of wing is narrowed a little apically in both species and the discal cell is widened at inner cross-vein, causing the latter to be very short, and even in some cases the second and third veins are fused for a short distance at this point.

Length, 2-2.5 mm.

Habitat.—Type and 4 paratypes, Higuito, San Mateo, Costa Rica (P. Schild).

Type.—Cat. No. 27697, U. S. N. M.

***Sphaerocera striata*, new species.**

Female.—Differs from the preceding species in having the femora black, becoming yellowish at tips, and the tibiae brownish in middle. The cheeks are microscopically striate and glossy in center, and the scutellum has the central part between the tubercles quite noticeably produced, giving it a triangular appearance, while the tubercles are set on slight elevations that are quite obvious from above. In all four species with dorsal pale spots on abdomen the second costal division is about four times as long as third, or even longer.

Length, 2.5 mm.

Habitat.—Holotype, Fort Landerdale, Florida, February 19, 1919 (A. Wetmore).

Type.—Cat. No. 27695, U. S. N. M.

***Sphaerocera nigrifemur*, new species.**

Female.—A darker species than last, the pale parts of legs more brownish and not so extensive. Center of cheeks granulose. Scutellum rather evenly rounded, the tubercles very small. Basal segment of hind tarsus a little longer than in last species, slightly longer than next two segments combined.

Length, 2.5 mm.

Habitat.—Holotype, Glen Echo, Maryland, August 28, 1921 (J. R. Malloch).

Type.—Cat. No. 27696, U. S. N. M.

***Sphaerocera scabra* Spuler.**

I have not seen this species but judging from the description it ought to be easily distinguished from *pusilla*.

Known only from South Bend, Washington.

***Sphaerocera pusilla* Fallen.**

I have seen several specimens from this country which appear to belong to this species. In my personal collection there are examples of *nit da* Duda, *parapusilla* Duda, and *pusilla* Fallen.

These three species are extremely difficult to distinguish from each other and the specimens from North America which I refer to above differ from all of these about as much as any of these do from each other. Very careful comparisons of numbers of specimens are essential to determine the status of these species.

Spuler records *pusilla* from Washington, Idaho, British Columbia, Massachusetts, Illinois, and District of Columbia. I have seen specimens from Illinois and Virginia.

NOTES AND NEW SPECIES (LEPIDOPTERA).

By WM. BARNES AND F. H. BENJAMIN, *Decatur, Illinois.*

Citheronia splendens Druce.

Eacles splendens Druce, Biol. Centr.-Amer., Lep., Het., 1886, Vol. 1, p. 169, pl.

XV, f. 12 (type); Biol. Centr.-Amer., Lep., Het., 1897, Vol. 2, p. 413, pl. LXXIX, f. 11.

Citheronia splendens Packard, Mono. Bomb. Moths, Part 2, 1905, p. 138, pl.

XVIII, ff. 2-2a; pl. XV, f. 1 (larva); pl. LV, ff. 1-1b (larval charac.).

Mr. O. C. Poling caught some examples of this species and reared others in the Baboquivari Mountains, Pima Co., Arizona.

In order to be sure that the U. S. specimens in no way differed from Mexican material we sent a specimen to Dr. Schaus who kindly compared it.

Cisthene (*Ozodania*) *juanita*, new species.¹

Head, palpi, tegulae, and thorax black; patagia black edged dorsomesially with crimson; abdomen crimson. Fore wing: ground color dull black, untinged by brown or grey; inner margin broadly edged with orange-yellow; an elongated red-orange spot on costa. Hind wing: ground color crimson; with a black apical patch extending to vein 2. Beneath: much as above, the markings on the fore wing tinged with scarlet and somewhat larger.

Expanse.—19 mm.

Distinct from all described U. S. species of the subgenus *Ozodania* by the possession of a black head. Apparently not like any described neotropical species although closer to the Mexican *phaeocephus* than to any other known to us. Dr. Schaus reported inability to match the type with Mexican material.

¹Barnes & Lindsey have shown (Ann. Ent. Soc. Am., 1922, Vol. XV, p. 98) that *Eudesmia* Hbn., type *ruficollis* Hbn., has priority over *Cisthene* as used by Hampson; while *Cisthene* Wlk., type *subjecta*, as fixed by Grote, 1874, and Kirby, 1892, has priority over *Illice* Wlk. *C. picta* B. & McD. forms a good connecting link between *Ozodania* and *Cisthene*. As these are merely separated by a secondary sexual character, and because of the presence of an intermediate, we use *Ozodania* in a subgeneric sense.

Type locality.—Baboquivari Mts., Pima Co., Arizona.

Type.—Holotype ♂, 15–30 Aug., 1924 (O. C. Poling), in Barnes Collection.

Cerastis lobato Barnes.

Pseudoglaea lobata Barnes, Can. Ent., 1904, Vol. 36, p. 237.—Barnes & McDunnough, Contr. N. H. Lep. N. A., 1912, Vol. 1 (4), p. 11, pl. IV, f. 1 (type ♂).

Agrotis hahama Dyar, Ins. Insc. Menst., 1919, Vol. 7, p. 74.

Professor M. Draudt has called this synonymy to our attention, and a specimen compared with the type of *lobato* was sent to Dr. Schaus for comparison with the type of *hahama*.

The species is not common in collections, the National Museum only possessing the type of *hahama*, while until last year the type of *lobato* was the only specimen in the Barnes Collection. Recently another specimen was received, followed by two more, so that the Barnes Collection now possesses four examples. These tend to show the species to be somewhat variable in color and maculation.

The type of *hahama* came from Zacualpan, Mexico; the type of *lobato* from the Chiricahua Mts., Arizona. Other Arizona records are Palmerlee and Hereford, Cochise County. Draudt states that he has "some ♂♂ and a ♀" from Mexico, so that in all probability the species is really a neotropical one reaching its northern limit in Southern Arizona.

Dr. Dyar's placement in *Agrotis* caused us to examine the fore tibiae. These are heavily spined, so that, following Hampson's keys the species would fall into the genus "*Agrotis*."

The species is, however, so closely allied in all other characters and habitus with *olivata* that we immediately began to examine that species to try to find spines. There are weak spines on the fore tibiae of at least some specimens of *olivata*, other specimens apparently did not possess the spines or had lost them. While there has been a reduction of tibial armature on the fore legs of *olivata* there has been a decided strengthening of tarsal armature; the fore metatarsus ending in a long curved claw, with other spines strengthened, claw-like, indicative that *Pseudoglaea* Grt., type *blanda*, may have to be resurrected for *olivata*.

Examination of a European specimen of *oxalina* showed a small spine on the fore tibia, but the tarsi possessed only the ordinary armature of spines.

Were this the only case where the presence or absence of spines appeared of little or no generic value, we would be tempted to place *olivata*, *lobato* and *oxalina* in separate genera, which would seem a logical course, but we have in mind the case of *Sidemia devastator* Brace, some specimens of which

possess a spine on the hind tibia and would therefore key to *Protagrotis*, and the case of *speciosa* Hbn., some specimens of which possess spines on the fore tibiae and others lacking them, a fact which has already been discussed in detail by Dr. McDunnough in Canadian Entomologist. Also *Trichorthosia spinosa* B. & McD. possesses spines on the fore tibiae.

We are therefore inclined to temporarily place more stress on the Glaea-like habitus of the species Hampson places in "*Mythimna*" than in the presence or absence of spines on the fore tibiae.

The proper generic name to use for these insects is also questionable. *Mythimna* has as type *albipuncta*, designated by Duponchel, 1829, and is obviously incorrect. *Orthosia* takes as type *instabilis* designated by Curtis, 1828, so that *Cerastis* Ochs., type *rubricosa*, appears to be the oldest available generic name. A thorough revision of the genera allied to *Agrotis* will probably be necessary before any stability of nomenclature can obtain. We might here again mention that *Agrotis* is a Tentamen genus, taking as type *segetum*. We have not as yet determined what genus to use instead of *Agrotis* as used by Hampson, but *Triphaena* Hbn., type *pronuba*, designated by Duponchel, 1829, will probably eventually be substituted. We have already called attention to the fact that *Noctua* falls to *Phalaena*, both taking as type, under the present code, *typica*.

Morrisonia diplogramma Schaus.

Himella diplogramma Schaus, Jour. N. Y. Ent. Soc., 1903, Vol. 11, p. 232.

Eriopyga diplogramma Hampson, Cat. Lep. Phal. B. M., 1905, Vol. 5, p. 305 (ignot.), pl. LXXXVII, f. 7 (type).

Morrisonia albidior Barnes & McDunnough, Journ. N. Y. Ent. Soc., 1910, Vol. 18, p. 153; Contr. N. H. Lep. N. A., 1912, Vol. 1 (4), p. 31, pl. IX, f. 4 (type ♀).

Scriptania inquisita Dyar, Ins. Insc. Menst., 1919, Vol. 7, p. 164.

Professor Draudt called our attention to this synonymy. As a check against possible error, a specimen compared with the type of *albidior* was submitted to Mr. Schaus for comparison with the types of *diplogramma* and *inquisita*. We are not at all sure of the generic placement, never having seen a specimen with the abdomen unrubbed. We temporarily retain the species in *Morrisonia* as placed by Barnes & McDunnough, the vestiture surrounding the eyes being similar to species of that genus.

Homohadena loculosa Grote.

Perigea loculosa Grote, Pap., 1881, Vol. 1, p. 154.—Smith, Bull. U. S. N. M., 1893, Vol. 44, p. 154.

Homohadena loculosa Hampson, Cat. Lep. Phal. B. M., 1906, Vol. 6, p. 190, pl. CI, f. 5.—Barnes & McDunnough, Contr. N. H. Lep. N. A., 1913, Vol. 2 (1), p. 24, pl. XI, f. 15.

Bryomima continentis Dyar (♂), Proc. U. S. N. M., 1917, Vol. 51, p. 11.

Bryomima oziphona Dyar (♀), Proc. U. S. N. M., 1917, Vol. 51, p. 11.

Professor Draudt called to our attention that *continentis* was probably a synonym of *loculosa*. Knowing the species to be somewhat sexually dimorphic we sent both sexes to Dr. Schaus for comparison with the type of *continentis* and any other neotropical species which might be involved. We are informed that the female agrees with the type of *oziphona*.

Phobolusia duomaculata, new species.

Fore wing ground color olivaceous-grey, more or less tinged with luteous-brown, and covered with dense metallic strigae; t.a. and t.p. lines blackish, distally marked with white, the former waved, the latter excurved around cell; a large black rounded "reniform" at end of cell connected to a somewhat smaller black "subreniform"; s.t. line white, waved; a terminal row of black dots; fringe dusky. Hind wing: ground color variable, grey, more or less whitish basally; blackish discal dot present or absent; a terminal row of black dots; fringe grey, somewhat checkered with white. Beneath: whitish, more or less marked with black, a discal dot on each wing.

Expanse.—♂, 13–14.5 mm.; ♀ 16 mm.

Allied to *brimleyana* Dyar and *grandimacula* Schaus, but easily distinguished from both by the possession of the "subreniform." *P. grandimacula* is a neotropical species not known from the United States. *P. brimleyana* was described from a single female from North Carolina. The Barnes Collection possesses it from St. Petersburg, Florida, February, March, July, October, December, and Cedar Bluff, Mississippi, May (Benjamin). We are indebted to Dr. Schaus for a specimen of *grandimacula*, which has enabled us to compare these species, and for the information that the Texas species is unknown to him from the Neotropics.

Type localities and number and sexes of types.—Holotype ♂, San Benito, 16–23 June; allotype ♀, Brownsville, no date; 1 ♂ paratype, San Benito, 16–23 June; 2 ♂, 1 ♀ paratypes, Brownsville, no date.

Types.—In Barnes Collection; 1 ♂ paratype, in U. S. N. M.

OBRIMA Walker.

Obrima pyraloides Walker, Cat. Lep. Het. B. M., 1856, Vol. 9, p. 135 (*pyraloides* sole species and therefore type).

Obrima pimaensis, new species.

Palpi reddish brown. Head, thorax, and abdomen pale ochreous more or less tinged with olivaceous. Fore wing: ground color pale ochreous more or less tinged with olivaceous and dusted with obsolescent brownish scales; t.a. line olivaceous, irregular, more or less obsolescent; orbicular present or absent,

when present as a black point only; median line pale, nearly erect through cell, thence inwardly oblique to submedian fold, thence outwardly oblique to inner margin; reniform diffuse, indeterminate, darkening the edge of the median line in the cell; distal half of the median space more or less occupied by darker clouding; t.p. line absent; s.t. line pale, bordered by dark cloudings, irregular, angulate; terminal row of dark dots on veins present or absent; fringe practically concolorous. Hind wing pale yellowish, distally darker; a terminal row of dots present or absent; fringe pale. Beneath: pale creamy-ochre, more or less tinged with brownish; discal dots usually absent.

Expanse.—39–44 mm.

Closely allied to *rinconada* Schaus (Trans. Am. Ent. Soc., 1894, Vol. 21, p. 240) and very probably only a more northern race of that species. We are indebted to Dr. Schaus for the loan of a topotypical specimen of *rinconada* compared with type, and for the information that the tropical specimens before him are consistently darker with more pronounced black irrorations on the primaries.

Type locality.—Baboquivari Mts., Pima Co., Arizona, elevation approximately 5,000 ft.

Number and sexes of types.—Holotype ♂ and 5 ♂ paratypes, 15–30 June, 1923, O. C. Poling Coll.

Types.—In Barnes Collection; paratype in U. S. N. M.

Aglossa gigantalis, new species.

Fore wing: ground color blackish shaded with yellow; all markings yellow; inner line marked on costa, else obsolescent; a yellow discal spot with a black central dot; outer line broad on costa, narrow below, strongly excurved and denticulate; five yellow dots on costa between the inner lines; fringe blackish. Hind wing: ground color fuscous-grey; median shades of darker-grey and yellowish-grey forming a diffuse double line nearly parallel to the outer margin; a narrow blackish outer line; fringe slightly paler than the wing but broadly interlined and appearing nearly concolorous. Beneath: fore wing fuscous, with yellow costal markings as above, except that the inner line is not indicated; hind wing yellowish, with a black medial line, and a black outer line.

Expanse.—38 mm.

The large size of the present species, as well as the peculiar markings distinguish it from all other U. S. species. Dr. Schaus informs us that these same characters distinguish it from any neotropical species known to him.

Type locality.—Baboquivari Mts., Pima Co., Arizona.

Type.—Holotype ♀, 15–30 June, 1924 (O. C. Poling), in Barnes Collection.

Lepidomys nevalis, new species.

Sexes similar. Head and palpi greenish-white. Thorax bright pale purple more or less marked by green especially on the patagia. Abdomen cream color.

Fore wing: ground color bright green on fresh specimens, olive green on old specimens, an inner pure white, transverse line, from two-fifths out on costa, to one-fifth out on inner margin; a similar, parallel, outer line from near apex; fringe pure white. Hind wing and fringe pure white except for a slightly soiled appearance along outer margin in some specimens. Beneath: whitish, the fore wing tinged with green and showing the transverse white lines of the upper side.

Expanse.—21–24 mm.

Related to *viridalis* B. & McD. and *obliquata* Hy. Edw. and apparently replacing these in Southern Nevada and the similar regions of Northern Arizona and Western California. It is easily distinguished from the former by the oblique nature of the transverse bands, and from the latter because of the possession of two bands on each fore wing. These three species form a group not strictly congeneric with *irrenosa* Guenée,¹ the type of *Lepidomys*, which is a sexually dimorphic species. According to Sir George Hampson, *Lepidomys irrenosa* Gn. has priority over *Chalinitis olealis* Ragonot.

Dr. Schaus informs us that the species is unknown to him, either from the Neotropics or elsewhere.

Type localities and number and sexes of types.—Holotype ♂, 24–30 April; allotype ♀, 16–23 April; paratypes, 12 ♂♂, 16–23 April; 5 ♂♂, 24–30 April; 3 ♂♂, 16–23 May; 5 ♀♀, 16–23 April; 1 ♀, 24–30 April; 5 ♀♀, 16–23 May; all Clark Co., Nevada; 1 ♂, 1–15 July, 1921, Charlestown Mts., Southern Nevada; 5 ♂♂, 1–7 April; 2 ♂♂, 8–15 April; 1 ♂, 16–23 May; 1 ♂, 24–30 May; 2 ♀♀, 1–7 April; 2 ♀♀, 8–15 April; all San Bernadino Co., Calif.; 1 ♀, April, Walters Station, California; 2 ♀♀, no data; 4 ♂♂, April; 36 ♂♂, 1–7 May; 22 ♂♂, 8–15 May; 1 ♂, 8–15 June; 14 ♂♂, no date; 5 ♀♀, 1–7 May; 3 ♀♀, no date, all Mohave Co., Arizona; total 109 ♂♂, 27 ♀♀, mainly collected by O. C. Poling.

Types.—In Barnes Collection; paratypes in U. S. N. M. and Canadian National Collections.

¹A single specimen of a fourth species of the same group was collected by Mr. O. C. Poling, in the Baboquivari Mountains, Pima Co., Arizona. This was sent to Dr. Schaus for comparison with the Mexican material in the National Museum. Reply came, "I think this the male of *Anemosella basalis* Dyar described from female." The genus *Anemosella* Dyar was erected for the new species *basalis* Dyar from Zacualpan, Mexico, both genus and species described in Proc. U. S. N. M., 1915, Vol. 47, p. 399, *basalis* being sole species and designated type. More material is awaited before adding *basalis* to our lists, but in all probability the genus *Anemosella* will be available for *viridalis* B. & McD., *obliquata* Hy. Edw. (*albistrigalis* B. & McD.), and *nevalis* B. & Benj.

EPIPEROLA Dyar.

Genotype.—*Trabala drucei* Schaus.

Epiperola Dyar, Journ. N. Y. Ent. Soc., 1878, Vol. 6, p. 238 (*drucei* sole species and designated type); Proc. U. S. N. M., 1906, Vol. 29, pp. 360, 382.

Epiperola perornata Dyar, Proc. U. S. N. M., 1906, Vol. 29, p. 383.

We are in receipt of a single male from the Baboquivari Mts., Pima Co., Arizona (O. C. Poling), which we submitted to Dr. Schaus for comparison with neotropical material.

Dr. Dyar's type came from French Guiana but Dr. Schaus informs us that he has other specimens from Costa Rica, and that it is a Limacodid.

Both the genus and species are extremely peculiar and do not find any close ally in any known species from Boreal America. In fact the genus violates the keys and the usual conception of its family, vein 8 of the hind wing anastomosing with cell near base only. According to Forbes' Key (Psyche, 1914, Vol. 21, pp. 53-65) it would fall into the Cossidae. By Hampson's Key (Cat. Lep. Phal. B. M., 1898, Vol. 1, pp. 17-20) it falls into the Ratardidae or the Cossidae.

THE GENUS COCCOTORUS LECONTE (COLEOPTERA).

By F. H. CHITTENDEN, U. S. Bureau of Entomology.

On September 5, 1924, Mr. Arthur G. Ilse wrote from D'Hanis, Medina County, Texas, in regard to a curculio breeding from the seeds of a bush called in that region "wild peach," determined in the Bureau of Plant Industry as *Prunus minutiflora*. At the time of receipt beetles were already issuing or had issued from the fruit and specimens were referred to Mr. Fred E. Brooks, who in turn showed them to the writer, stating that he suspected that although the species was closely related to the plum gouger, *Anthonomus scutellaris* Leconte, there were some differences. Accordingly, the writer has made a study of this material, in comparison with related species, finding that the form from Medina County, Texas, is quite distinct from the other two species which have been classified by Dietz as belonging to the subgenus *Coccotorus*. Inasmuch as we now have three species of *Coccotorus* and the genus *Anthonomus* is already overcrowded with upwards of 90 described species, it is advisable and timely that the genus be recognized as such.

COCCOTORUS Leconte.

Coccotorus Leconte, J. L., Proc. Amer. Philos. Soc., 1876, p. 193.

Coccotorus Leconte, Dietz, W. G., Trans. Am. Ent. Soc., v. XVIII, p. 190, 1891.

Genotype.—*Coccotorus scutellaris* Lec.

Since this genus has been fully and ably described by Dietz, little remains for mention other than that it was founded principally on the outstanding feature of the male pygidium, which is large, strongly convex, transversely oval, more or less exposed, and inflexed, together with the deeply emarginate fifth ventral segment into which it is inserted.

The three species composing this genus may be separated by means of the following table:

Rostrum ♀ moderately short and thick, distinctly carinate; femoral teeth large, of middle femora nearly as long as anterior.

Vestiture of elytra dark reddish purple with few blackish tufted areas; prothorax with pale yellowish hairs, Me.—Tex. *scutellaris* Leconte.

Vestiture of elytra and venter bright red, strongly mixed with whitish gray hairs; prothorax bright red with a narrow median gray line, Nebr. *hirsutus* Bruner.

Rostrum ♀ longer and more slender, feebly carinate in front of eyes; femoral teeth short, of middle pair much smaller than anterior.

Vestiture whitish gray on elytra, thickly interspersed with long nearly black semierect hairs arranged in dense tufted areas; thorax scarcely lighter than elytra, Tex. *pruniphilus*, new species.

***Coccotorus pruniphilus*, new species.**

Elongate ovate, strongly convex; dark reddish brown throughout; head and rostrum from base to point of insertion of antennae somewhat sparsely clothed with stiff, dark brown, suberect hairs; prothorax densely coated with long dark hairs intermixed with a few gray hairs in basal half; elytra densely clothed with very fine gray pubescence and with strongly subtessellately arranged large deep brown tufted areas of semierect hairs, imparting a very dark appearance to the insect.

Rostrum ♀ about $\frac{1}{2}$ as long as the body, longer than head and prothorax together, nearly straight, slender, moderately thickened at the base from which it narrows gradually to the point of insertion of the antennae, from there subequal in diameter; feebly, or not at all, carinate, except in a short area in front of the eyes. Antennae inserted $\frac{3}{5}$ from base; scape nearly as long as funicle. Prothorax parallel at sides in basal three-fifths, slightly widest in front of middle, abruptly and obliquely narrowed to apex. Elytra with prominent humeri, widest at a point less than one-fourth from the apex; striae rather narrow, deeply impressed, somewhat irregularly coarsely punctate, punctures obscured by vestiture. Anterior femoral teeth acute, proximal edge nearly perpendicular, median feeble, scarcely larger than posterior pair.

Rostrum ♂ about $\frac{2}{5}$ as long as the body, stouter than in ♀, a little more strongly pubescent, feebly carinate from base to near the middle. Antennae inserted nearer the apex. Pygidium short oval, outline subcircular, usually retracted.

Length ♀ 5.4 mm.; width 2.9 mm.; length of rostrum ♀ 2.6 mm.; length ♂ 5.0 mm.; width 2.7 mm.; length of rostrum ♂ 2.0 mm.

D'Hanis, Llano, Tex.

Reared from the seed of *Prunus minutiflora* in June, 1924 (Arthur G. Ilse).

Type ♀.—Cat. No. 27478, U. S. National Museum.

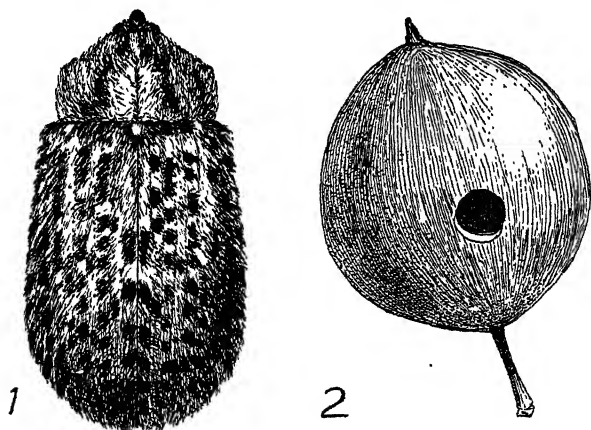


Fig. 1. *Coccotorus pruniphilus*, showing outline and vestiture.

Fig. 2. Wild plum seed, showing exit hole of *Coccotorus pruniphilus*.

Closely related to *scutellaris*, differing especially by the much more hairy and pubescent vestiture, the longer, more slender, feebly carinate female rostrum and the more coarsely punctate elytral striae. The much more numerous dark hairy tufts on the elytra, and the retracted short oval pygidium in the male are also striking characters. In *scutellaris* the male pygidium is more extruded in all specimens examined.

The rostral carina is obsolete or wanting in some females; in others it is apparent only in the proximal fourth or fifth. No short-beaked females have been observed in the material examined, although these are of common occurrence in *scutellaris*.

Coccotorus scutellaris Leconte.

Anthonomus scutellaris Leconte, J. L., Proc. Ac. Nat. Sci., Phila., 1858, p. 79;

Dietz, l.c., p. 190; Blatchley and Leng, Rhynch. E. U. S., 1916, p. 287, 288.

Anthonomus (?) *prunicida* Walsh, B. D.; Prairie Farmer, June 13, 1863, p. 372, figs. I, II, Walsh, Proc. Bos. Soc. Nat. Hist., 1863, p. 309.

Coccotorus scutellaris Leconte, Proc. Am. Phil. Soc., 1876, p. 194.

This species is sufficiently well known to require no further remarks here other than to add a few exact localities.

The species was described from Texas and Georgia. Walsh added Rock Island, Ill., Blatchley and Leng, Lake and Posie Counties, Ind., New York vicinity, Lakehurst, N. J., and Massachusetts. Localities noted by the writer include: Missouri,

Topeka, and Riley County, Kans.; Cambden, Ark., Fort Collins, Colo.; Fort Valley, Ia.; French Creek, W. Va.; Prelsburg, Dallas, Tex.

The other two species here treated, as far as known, attack only wild *Prunus* but may well be under suspicion as potential pests for the reason that although they have not yet been detected on cultivated fruits, there is strong probability that in the course of time, with the ultimate disappearance of their wild food plants in large areas, they may not hesitate to attack cultivated *Prunus*, otherwise they would eventually perish. They are hardy insects and capable of sustained flight.

***Coccotorus hirsutus* Bruner.**

Coccotorus hirsutus Bruner, Rept. Nebr. State Bd. Agr., f. 1888, p. 126.

Anthonomus hirsutus Bruner, Dietz, W. G., Tr. Am. Ent. Soc., v. 18, p. 191, 1891.

Body four-ninths as wide as long, red-brown throughout. Vestiture brightly colored, consisting of dense long, hirsute or shaggy hairs, those on thorax and elytra about equally long and closely crowded, on thorax and middle three-fourths of sutural interval ferruginous, on elytra white and ash-gray, more or less densely mottled with shades of ferruginous; lower surface sparsely clothed with long fine ash-gray hairs; legs more sparsely clothed with shorter and finer hairs.

Rostrum longer and slenderer than in *scutellaris*, feebly carinate. Femoral teeth shorter, anterior tooth with distal edge of base strongly oblique.

Length 4.5 mm.; width 2.0 mm.; rostrum 2.0 mm.

West Point, Nebraska.

Attacks the fruit of the sand cherry (*Prunus pumila*) in a manner similar to *scutellaris* on plum. The sand cherry is edible and although it appears to have no very definite commercial status, it was used, according to its describer, by many of the settlers in Nebraska, especially by those living in some of the northwestern counties. Of its injuries, he states that in the month of June he observed the punctures of the beetle on the young fruit when it was about the size of a large pea, that its work was quite like that of the plum gouger, and that its injury to the fruit was quite as decided.

**TWO NEW SPECIES OF THE TACHINID GENUS LIXOPHAGA,
WITH NOTES AND KEY (DIPTERA).**

By J. M. ALDRICH.

Although I have published on this genus recently (Insecutor Ins. Menstruus, Vol. 12, 1924, p. 146), the rearing of two new species calls for the publication of descriptions, and gives opportunity to add a key and notes.

The genus includes only small species, which have the first

posterior cell ending almost in the exact tip of the wing. They have the eyes bare; face receding, parafacials bare except a few small bristly hairs close to vibrissae; third antennal joint elongate, second short, arista with small basal joints; two upper frontals reclinate; the lowest frontal not quite reaching the level of the tip of second antennal joint; palpi and proboscis normal. Discal abdominal bristles absent or feebly developed. Venation normal except as noted, third vein with only a few hairs at base.

KEY TO SPECIES OF LIXOPHAGA.

Males.

1. Without orbital bristles.....2.
With orbital bristles.....3.
2. Abdomen broadly yellow on sides (West Indies; Gulf region)
diatraeae Townsend.
Abdomen without yellow on sides (widespread)*variabilis* Coquillett.
3. Parafacial much narrower below than third antennal joint (Virginia).....
mediocris, new species.
Parafacial as wide as third antennal joint (widespread).....*plumbea* new species.

Females.

1. Parafacial at narrowest wider than third antennal joint... *plumbea* new species.
Parafacial below much narrower than third antennal joint2.
2. Third abdominal segment when viewed from behind with broad median black stripe (Virginia).....*mediocris* new species.
Third abdominal segment with narrow partial stripe or none.....3.
3. Abdomen with coarse black dots from which the hairs arise, and usually distinctly yellow on sides basally.....*diatraeae* Townsend.
Abdomen without coarse dots, the sides not yellow.....*variabilis* Coquillett.

Lixophaga variabilis Coquillett.

Hypostena variabilis Coquillett, Jour. N. Y. Ent. Soc., III, 1895, 57; Revis. Tachin., 1897, 17, 62.

Lixophaga parva Townsend, Muscoid Flies, 1908, 86.

Euzenillia aurea Townsend, Jour. N. Y. Ent. Soc., XX, 1912, 111.

Euzenillia variabilis Townsend, Ins. Ins. Menst., IV, 1915, 121.

Tachinophyto variabilis Greene, Proc. U. S. Nat. Mus., vol. 60, 1922, 11, fig. 35, puparium.

Lixophaga variabilis Aldrich, Ins. Ins. Menst., XII, 1924, 146.

Specimens in the National Museum include the female type of *variabilis*, from Algonquin, Illinois (Nason), with another female having same data; the female type of *Euzenillia aurea*, from Melrose Highlands, Massachusetts (Townsend); the male type of *parva*, reared at Dallas, Texas, from *Lixus scrobicollis* by W. D. Hunter; other specimens reared from *Laspeyresia molesta* at Vienna, Virginia, by L. A. Stearns; from lepidopterous larva at Knoxville, Tennessee, by W. B. Cartwright

(Knoxville No. 1991); from *Carpocapsa pomonella* at Agnew, California, by J. F. Lamiman; from *Oberca maculata* at Washington, District of Columbia (Chittenden No. 6762); from apple twig borer, College Park, Maryland; from *Epiblema strenuana* Walker at Valley Forge, Georgia, by B. S. Brown (Quaintance No. 21903); and from *Sphenophorus pontederiae* at Stoughton, Massachusetts, by Doris H. Blake.

Unreared specimens are from Base of Mount Washington, New Hampshire (Townsend); Sebago Lake, Maine (Townsend); Waterbury, Connecticut (Townsend); Plummer's Island, Maryland (H. S. Barber); Lafayette and Monon, Indiana (Aldrich); Aberdeen, South Dakota (Aldrich); Opelousas, Louisiana (Pilate); Audubon Park, New Orleans, Louisiana (T. E. Holloway); and Havana, Cuba (C. F. Baker).

The rearing from *Carpocapsa* mentioned by Coquillett, 1897, 17, is an error of identification; the single male specimen has orbitals and must belong to another species, although undoubtedly congeneric. As it is not in very good condition, I refrain from describing it. This is the same specimen from which Townsend drew the male characters of *Euzenillia* (Ins. Ins. Menst., IV, 1916, 32).

The specimens upon which Coquillett based his two other rearing records in the same place are not now with the species, and I fear were found to belong elsewhere; but they can not now be traced. Some of his localities on page 68 are not represented in the material now assembled under the species, and probably the specimens were also removed to other species.

• ***Lixophaga diatraeae* Townsend.**

Euzenillipsis diatraeae Townsend, Ins. Ins. Menst., IV, 1915, 76.—Holloway, Jour. Econ. Ent., XII, 1919, 176.—Van Zwaluwenberg, Jour. Econ. Ent., XVI, 1923, 227.

Lixophaga diatraeae Aldrich, Ins. Ins. Menst., XII, 1924, 146.

This is an important parasite of the sugar-cane borer, *Diatraea saccharalis*. Originally occurring in Cuba, it has been introduced into Louisiana and Mexico (Los Mochis, Sinaloa). In Mexico it is said to parasitize *Diatraea lineolata* Walker.

Material in the National Museum consists of 35 specimens including the type, from Cuba, Porto Rico and Trinidad, mostly bred. While the male separates readily from *variabilis* on account of having the abdomen broadly yellow on the sides, the female is almost alike in the two species. The unknown female of the specimen Coquillett took for the male of *variabilis* must be almost inseparable from these.

• ***Lixophaga plumbea*, new species.**

Male.—Front wide (by micrometer three measured .36, .37, and .40 of head-width, averaging .38); the parafacials and parafrontals rather plumbeous, or

lead colored, the latter, however, slightly approaching silvery. Two pairs verticals, the outer small; ocellars normal, two pairs of orbitals, frontals seven, the upper three reclinate, the lowest frontal at the level of the tip of the second antennal joint. Parafrontals bare, about as wide as the third antennal joint. Antennae black, reaching almost to the edge of the mouth; the third joint five times the second. Arista short, thickened for more than half its length. Vibrissae at edge of mouth, 6 or 8 decreasing bristles in a rather close row on the facial ridges ascending about two-fifths of the way, but the upper ones minute. Proboscis small, palpi normal, yellow. Bucca about one-third the eyeheight. Frontal stripe at narrowest less than one-half the width of one parafrontal. Thorax gray, with stripes as in preceding species. Chaetotaxy: acrostichal 3, 3; dorsocentral 3, 3; humeral 3; posthumeral 1; presutural 1; notopleural 2; supraalar 2 (the posterior large); intraalar 3; postalar 2; scutellum with two pairs of marginals and one still longer pair of apicals, no smaller hairs between them, and one pair of small discals; sternopleural 2, 1; pteropleural minute; scutellum concolorous with thorax, not at all yellow at apex.

Abdomen entirely black, segments two and three broadly gray, pollinose, the pollen becoming thin about the middle so that the posterior half, or in some lights more, is subshining. A narrow median shining stripe on edge. Fourth segment with a more dense and slightly yellowish crossband of pollen on the anterior half, the remainder shining; first and second segment with one pair median marginals and one lateral; third segment with a marginal row of 10; fourth segment with two erect rows on apical half. Venter black, thinly pollinose, without any special patch of hairs.

Legs black, claws and pulvilli small. Mid tibia with a single bristle on the outer front side. Hind tibia with a very irregular row on outer side.

Wings hyaline, the fourth vein with an oblique rounded bend meeting the third vein in the margin so as to close the first posterior cell only slightly before the apex; third vein with two or three hairs at base; no costal spine.

Female.—Front scarcely wider than in male (by micrometer 3 measured .38, .38, and .41, average .39). Parafrontal decidedly wider than third antennal joint; otherwise as in male.

Described from 11 males and 11 females. 13 of these specimens of both sexes were reared by R. A. Cushman at East Falls Church, Virginia, from *Rhyacionia frustrana* Comstock; the dates of emergence are from June 30 to July 7. One male specimen was reared at Falls Church, Virginia, from *Laspeyresia molesta* Busck, on July 10, 1920. One female from Red Bank, New Jersey, August 8, was reared from *Phalonia oenotherana* Riley. One female Riverton, New Jersey, Exp. No. 86—E1. Unreared specimens are from Brookings, South Dakota (Aldrich), Falls Church, Virginia (Banks), Plummer's Island, Maryland (Shannon). The type is from the lot first mentioned.

One additional female from Lacrosse, Indiana, July 18, 1913, has a row of 10 marginals on the second segment, one discal on the third segment, and a small fourth sternopleural below

the others anteriorly. It agrees so perfectly in other respects that I do not doubt that it belongs to the same species.

Type.—Male, Cat. No. 28110, U. S. N. M.

***Lixophaga mediocris*, new species.**

Male.—General color gray with black legs and antennae, and yellow palpi. Abdominal segments 2–4 shining black on more than apical half. Front rather broad (by micrometer three measured .30, .34, .36 of headwidth, averaging .33), the pollen tinged with yellow; parafacials bare, silvery gray, narrow, less than half as wide at narrowest as third antennal joint. Verticals two pairs, ocellars normal, orbitals two pairs, frontals about 6, second pair large and reclinate, first and third smaller, lowest even with tip of second antennal joint; vibrissae at edge of mouth, not approximated, three or four diminishing bristles or hairs above them. Antennae reaching almost to vibrissae, third joint four times the second, arista rather long, enlarged nearly to middle. Palpi of ordinary size, yellow; bucca almost one-fourth the eyeheight.

Thorax black, a little bronzed, when viewed from behind showing four dark stripes alternating with wider yellowish-gray pollinose ones; the outer dark ones interrupted at the suture, and the inner somewhat blending behind it. Chaetotaxy: acrostichal 3, 3 (one just before the suture); dorsocentral 2, 3; humeral 2, posthumeral 2; presutural 2 (the inner small but distinct); noto, pleural 2; supraalar 2; intraalar 3; postalar 2; scutellum with two lateral pairs a small discal, and a minute apical pair usually not crossed, sometimes irregular. sternopleural 2, 1; pteropleural 0.

Abdomen subshining black, the basal third to half of segments 2–4 with yellowish pollen interrupted or partially so in middle and interspersed with dots, especially on third; first and second segments with one pair median marginals and one lateral; third segment with marginal row of 6 stout; fourth with small discals and stout marginals. Genitalia black. Venter with the pollinose bands as on dorsum, no specialized patches of fine hairs.

Legs black, claws and pulvilli small. Front tibia with one bristle on outer hind side; mid tibia with one on outer front; hind tibia with very irregular row on outer side.

Wings hyaline, third vein with usually 2 hairs at base; fourth vein with rounded, oblique bend, the apical cell open and ending but little before extreme tip of wing.

Female.—Front wider (in three .37, .37, and .38, average .37); third abdominal segment with a pair of smallish but distinct discals. The pollen of the abdomen forms wider and less distinct bands than in the male, but there is the same appearance of a narrow, median dark stripe, less distinct or absent on fourth segment. Scutellum with minute apicals as in male. No piercer or special egg-laying organ.

Length, 3 to 3.8 mm.

Described from 29 males and 23 females reared at East Falls Church, Virginia, from *Rhyacionia frustrana* Comstock, by R. A. Cushman. Emergence June 26 to July 8, 1924.

Type.—Male, Cat. No. 28109, U. S. N. M.

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LIST OF PARASITIC INSECTS REARED FROM HOST INSECTS
COLLECTED IN THE VICINITY OF BROWNSVILLE, TEXAS.

BY R. A. VICKERY, U. S. Bureau of Entomology.

The parasitic Hymenoptera and parasitic Diptera listed in this publication were reared at Brownsville, Texas, during the years from 1910 to 1917. The species of Diptera were identified by Dr. J. M. Aldrich and Mr. W. R. Walton, the Hymenoptera by R. A. Cushman and A. B. Gahan, the Lepidoptera by Dr. H. G. Dyer. The identified specimens are located in the collections of the U. S. National Museum. The author is also indebted to Messrs. Gahan and Cushman and to Mr. S. A. Rohwer for an examination and criticism of the completed manuscript.

HYMENOPTERA: BRACONIDAE.¹

Meteorus laphygmae Viereck, reared from:

<i>Laphygma frugiperda</i> (A. & S.)	January, ² April, May, June, July, September, October, November, and December.
<i>Laphygma exigua</i> (Hbn.)	May, July, October.
<i>Prodenia</i> sp. ³	June, July, April.
<i>Feltia annexa</i> (Treit.)	April, May.
<i>Cirphis latiuscula</i> (H. S.)	November, December, February, March, and April.
<i>Cirphis unipuncta</i> (Haw.)	January, February, March.
<i>Monodes nubicolora</i> Gn.	April, May.
<i>Macaria punctolineata</i> Packard	May.
<i>Autographa</i> sp. ⁴	July.
<i>Eurymus eurytheme</i> (Bdv.)	October, March, December.
<i>Heliothis obsoleta</i> (Fabr.)	March, April, October.

¹Specimens were collected and parasites reared by C. L. Scott, E. G. Smyth, R. A. Vickery, and T. S. Wilson.

²The month given is that in which the host larvae were collected.

³*Prodenia latifascia* Walker, *Prodenia praefica* Grote, *Prodenia ornithogalli* Guenée, *Prodenia eridania* (Cramer), and *Prodenia eudiotopa* Guenée, were collected at Brownsville, but we could not separate the caterpillars.

⁴*Autographa brassicae* (Riley) and *Autographa oo* (Cramer) were collected at Brownsville, but we could not separate the caterpillars.

Apanteles marginiventris (Cresson), reared from:

<i>Laphygma frugiperda</i> (A. & S.)	January, April, May, September, October, November, and December.
<i>Laphygma exigua</i> (Hbn.)	May, October.
<i>Prodenia</i> sp.	April, June.
<i>Cirphis unipuncta</i> (Haw.)	January, October.
<i>Plathypena scabra</i> (Fabr.)	March.
<i>Autographa</i> sp.	October.
<i>Heliothis obsoleta</i> (Fabr.)	March, April.

Apanteles militaris Walsh, reared from:

<i>Cirphis latiuscula</i> (H. S.)	January, February, March, April, October, November, and December.
<i>Cirphis unipuncta</i> (Haw.)	January, February, March, April, and October.
<i>Heliothis obsoleta</i> (Fabr.)	October.

Apanteles rufocoxalis Riley, reared from:

<i>Cirphis latiuscula</i> (H. S.)	January, March, April, November, and December.
<i>Cirphis unipuncta</i> (Haw.)	February, March, April.

Microplitis varicolor Viereck, reared from:

<i>Cirphis latiuscula</i> (H. S.)	March, April.
<i>Cirphis unipuncta</i> (Haw.)	March, April.

Microplitis brassicae Muesebeck, reared from:

<i>Autographa brassicae</i> (Riley)	April.
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Microplitis feltiae Muesebeck, reared from:

<i>Feltia annexa</i> (Treit.)	June.
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Microplitis croceipes (Cress.), reared from:

<i>Heliothis obsoleta</i> (Fabr.)	April.
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Opius otiosus Gahan, reared from:

<i>Agromyza parvicornis</i> Loew	
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Zelee melleus (Cresson), reared from:

<i>Laphygma frugiperda</i> (A. & S.)	October.
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Chelonus texanus Cresson, reared from:

<i>Laphygma frugiperda</i> (A. & S.)	Every month except February.
<i>Laphygma exigua</i> (Hbn.)	October, July.
<i>Prodenia</i> sp.	June, July.
<i>Heliothis obsoleta</i> (Fabr.)	April.

Rogas laphygmae Viereck, reared from:

<i>Laphygma frugiperda</i> (A. & S.)	April, May, June.
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Rogas molestus Cresson, reared from:

<i>Autographa</i> sp.	March, April, June, July, and October.
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Rogas atricornis Cresson, reared from:

<i>Cirphis unipuncta</i> (Haw.)	January, February, March, and April.
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HYMENOPTERA: ICHNEUMONIDAE.

Sagaritis dubitatus (Cresson), reared from:

<i>Laphygma frugiperda</i> (A. & S.)	January, April, May, June, and July.
<i>Laphygma exigua</i> (Hbn.)	May.
<i>Autographa</i> sp.	April.
<i>Prodenia</i> sp.	July.
<i>Heliothis obsoleta</i> (Fabr.)	March, April.

Neopristomerus appalachianus Viereck, reared from:

<i>Laphygma frugiperda</i> (A. & S.)	March, April, May, June, July, August, September, October, and November.
<i>Laphygma exigua</i> (Hbn.)	October.
<i>Prodenia</i> sp.	April, July.

Ophion bilineatus Say, reared from:

<i>Laphygma frugiperda</i> (A. & S.)	January, April, May, June, August, September, October, November, and December.
<i>Laphygma exigua</i> (Hbn.)	May.

Enicospilus purgatus (Say), reared from:

<i>Cirphis latiuscula</i> (H. S.)	December.
<i>Cirphis unipuncta</i> (Haw.)	February.

Amblyteles brevipennis (Cress.)

<i>Cirphis unipuncta</i> (Haw.)	April.
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Gelis minimus (Walsh), reared from:

<i>Apanteles militaris</i> Walsh	December, February, March and April.
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Myrmicomorpha perniciosa Viereck, reared from:

<i>Apanteles militaris</i> Walsh	February.
<i>Meteorus laphygmae</i> Viereck	July.
<i>Rogas laphygmae</i> Viereck	July.

HYMENOPTERA: CHALCIDIDAE.

Spilochalcis pallens (Cresson), reared from:

<i>Meteorus laphygmae</i> Viereck	June, July, September.
<i>Rogas laphygmae</i> Viereck	July.

Spilochalcis torvina (Cresson), reared from:

<i>Meteorus laphygmae</i> Viereck	July, September.
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HYMENOPTERA: PTEROMALIDAE.

Dibrachys meteori Gahan, reared from:

<i>Meteorus laphygmae</i> Viereck	June, July.
<i>Sagaritis dubitatus</i> (Cresson)	June.
<i>Rogas laphygmae</i> Viereck	June.

Eupteromalus viridescens (Walsh), reared from:

Apanteles militaris Walsh December, February, March

HYMENOPTERA: EUPELMIDAE.

Eupelminius meteori Gahan, reared from:

Meteorus laphygmae Viereck July.

HYMENOPTERA: EULOPHIDAE.

Euplectrus platyhypenae Howard, reared from:

Prodenia sp. July.

Laphygma frugiperda (A. & S.) January, April, May, June,
July, September, October,
November, December.

Laphygma exigua (Hbn.) October.

Cirphis latiuscula (H. S.) March, April, October,
November, and December.

Cirphis unipuncta (Haw.) February, October.

Euplectrus comstockii Howard, reared from:

Heliothis obsoleta (Fabr.) March.

Autographa sp. April, June, July, and October.

HYMENOPTERA: ENCYRTIDAE.

Litomastix truncatellus Dalman, reared from:

Autographa sp. April, July, October.

DIPTERA: TACHINIDAE.

Archytas piliventris V. d. W., reared from:

Laphygma frugiperda (A. & S.) January, March, April, May,
June, August, September,
October, November, December.

Cirphis latiuscula (H. S.) October, November, December,
and April.

Cirphis unipuncta (Haw.) February, April.

Archytas analis Fabr., reared from:

Cirphis unipuncta (Haw.) April.

Monodes nucicolora Gn. May.

Peleteria robusta Wied., reared from:

Cirphis latiuscula (H. S.) April.

Cirphis unipuncta (Haw.) January, February, March.

Frontina archippivora Will., reared from:

Laphygma frugiperda (A. & S.) April, May, June, July.

Chaetophlepsis tarsalis Tns., reared from:

Autographa sp. July.

Plagia americana Van der Wulp, reared from:

Autographa sp. October.

- Phorocera marginalis* A. & W., reared from:
Macaria punctolineata Packard June, July.
Nemorilla maculosa Mg., reared from:
Amorbia emigratella Busck July.
Metachaea helymus Walker, reared from:
Monodes nucicolora Gn. May.

DIPTERA: SARCOPHAGIDAE.

- Helicobia helici* Town., reared from:
Lycophotia margaritosa (Haw.) April.

A NEW SPECIES OF *TRICHALOPHUS* (COLEOPTERA).

By F. H. CHITTENDEN, U. S. Bureau of Entomology.

Trichalophus foveirostris, new species.

Cylindrical ovate; black, antennae and legs dull dark brown, coated with minute scales of varying colors. Rostrum and head together longer than the prothorax, frontal fovea continuous with a deep, wide sulcus extending nearly to apex, punctuation moderate, dense. Prothorax about as long as wide, truncate at both extremities, sides very feebly arcuate, at middle of disc in median fourth a finely impressed line; surface of disc and sides moderately scabrous, feebly depressed in apical third, punctuation coarse, rugose, a small, yellow mass of scales just behind middle on each side; scutellum a little transverse, coated with yellow scales. Elytra considerably wider than prothorax, nearly twice as long as wide, humeri not discernible, sides subparallel, apex strongly narrowed. Elytral striae rather deep, with punctures large, subquadrate, usually closely but irregularly placed as regards distance; intervals 1 and 2 equal, 3 wider, remainder subequal; surface coated with more or less bronzy red, bronze brown, and black and yellow mixed; above the center on intervals 4 and 5 there is a conspicuous fascia of bright golden yellow scales, and toward the apical declivity there is a similar narrower fascia on interval 5. Ventral surface brown with fine coating of light pubescence. Legs moderately clavate, also feebly pubescent.

Length, 9 mm.; width, 4 mm.

Type locality.—Skyland, Page Co., Va., June 15, 1924 (Alan S. Nicolay). One specimen.

Type.—In Mr. Nicolay's collection.

This species obviously belongs to *Trichalophus* Lec., although the striae punctures of the elytra are quite distinct, instead of being "almost or quite obliterated" and the dorsal surface is squamose; in short, it is quite different from any described species known to the writer by the principal characters furnished in the description.

SOME OBSERVATIONS UPON NECREMNUS LEUCARTHROS (NEES) (HYMENOPTERA: EULOPHIDAE).

By T. R. CHAMBERLIN, U. S. Bureau of Entomology.

In the summer of 1923, the writer received at the laboratory of the U. S. Bureau of Entomology at Hyères, Var, France, some shipments of cocoons of the alfalfa weevil (*Phytonomus posticus* (Gyll.)) from which the eulophid, *Necremnus leucarthros* issued.¹ The character and identity of the insect was not known to the writer at the time of its emergence but it was suspected of being a secondary of the alfalfa weevil, possibly through *Itopectis maculator* (Fab.) or *Dibrachoides dynastes* (Försk.) In experiments conducted at the laboratory it could not be made to reproduce upon *Dibrachoides dynastes* but it reproduced freely as an external parasite upon the prepupae of the alfalfa weevil. No attempts were made to breed it upon *Itopectis maculator* because of the scarcity of this species.

PREVIOUS HISTORY AND DISTRIBUTION.

Necremnus leucarthros was first described by Nees von Esenbeck in 1834 under the name *Eulophus leucarthros* from specimens taken in flowers of *Anethus graveolentus* at Sickerhaus, Germany in July (1). The species was transferred to the genus *Necremnus* by Thomson (2) in 1878 who stated that it occurred all over Sweden but specified no locality. Dr. Franz Ruschka (3) records it as a parasite of the Chrysomelid, *Lema cyanella* Linn., infesting *Hordeum sativum* at Eisgrub, Moravia. The species is recorded and illustrated but not described by Graham-Smith (4) who states that it is a parasite in puparia of Diptera but he mentions no localities.²

In records of the alfalfa weevil work conducted in Europe in 1911, W. F. Fiske mentions an "external eulophid" found in alfalfa weevil cocoons, and Dr. Martelli in his "First Contribution to the Biology of *Phytonomus variabilis* Herbst" (5) speaks of an ecto-parasite of the larva which he calls "*Eulophus* sp." It may be that both of these men encountered the species under consideration. Dr. W. R. Thompson observed several species of Eulophids in his work on alfalfa weevil parasites in

¹The writer wishes to express his appreciation to Mr. A. B. Gahan for his determination of the insect and the references to the literature which he furnished.

²Of this Mr. Gahan says in correspondence, "I assume that it was somewhere in England, possibly at Cambridge where Graham-Smith was a lecturer * * *. It may be that the Graham-Smith record refers to a different species from that you are dealing with * * *. The host records seem to conflict * * *."

1912 and 1913 and he very probably saw this species although the writer has been unable to decide this point from Thompson's original notes. A study of material preserved by Mr. P. H. Timberlake at the Salt Lake laboratory of the Bureau of Entomology while he was engaged in parasite liberation there shows that the insect was found sparingly in material received from Portici, Italy, but Timberlake did not determine whether it was a primary or secondary parasite.

The writer has been able to add to the localities from which the parasite has been previously recorded the following: Piedimonte d'Alife, Italy, Tournon Ardèche and the environs of Chambéry, France. In the writer's experience the insect appeared rare except in a few instances where it was found in fair numbers.

REPRODUCTION OF NECREMNUS LEUCARTHROS (NEES).

The most important of the reproduction experiments with *N. leucarthros* was performed with 8 females and 1 male which were confined with 18 specimens of the host between June 9 and June 23, 1923, inclusive. The hosts, which usually were freshly spun prepupae of *Phytonomus*, were taken two at a time and kept in a tube with the eight females and one male from one to two days, when they were removed and two fresh prepupae supplied. The eggs, which were placed externally upon the hosts, were counted as accurately as was possible without disturbing them or the hosts but undoubtedly some eggs were overlooked. In six cases, egg records were not kept for the following reasons: one host was parasitized by a species of *Bathyplectes* and not oviposited upon, one died before oviposition by the parasites, one broke from its cocoon, the eggs on two were not observed until after they had hatched, and one pupated and cast the eggs off with the skin before they were counted. For some reason the parasites failed to oviposit upon one of the other hosts. On the remaining 11 hosts, a total of 212 eggs, or an average of 19.3 per host, were counted. The maximum number per host was 40 and the minimum 6. From the 40 eggs deposited upon a single host only four adults were produced, although most of the eggs hatched and many more than four of the larvae pupated. All of these were undersized. From this it would appear that so large a number of eggs per host is abnormal in nature. As many as 18 well developed adults were, however, secured from a single host.

The eggs were usually found on the day following the confinement of the parasites with the host. Most of the eggs were hatched on the day following that on which the eggs were observed. The meconium was cast in from 5 to 9 days, pupae appeared within 8 to 15 days and adults within 13 to 17 days.

Since two hosts were usually parasitized at the same time and these were kept and examined together throughout the experi-

ment, it was possible to study the effect of light or heavy feeding by the parasite upon the length of its larval period. When the number of larvae per host was large and the food supply per larva small, the larvae finished feeding early and pupated before the wellfed larvae which continued to feed until they had grown to large size. Nevertheless, results seemed to indicate that the pupal period in underfed individuals was somewhat lengthened, so that the whole time from egg to adult in underfed specimens was not shortened to the extent which might have been expected. The data on this last point are too meagre to do more than suggest the idea as stated.

CONCLUSIONS.

Though in our experience *Necremnus leucarthros* has proved to be rare, it has a wide distribution and breeds freely upon the prepupae of *Phytonomus posticus* in the laboratory. It would appear, therefore, that it could very probably be colonized in the United States and that it might increase its usefulness and parasitize a large percentage of the weevils under favorable conditions. This possibility is suggested by the case of the larval parasite *Tetrastichus incertus* (Ratz.) which has usually appeared unimportant as a parasite of the weevil in Europe but which in the summer of 1922, developed a high degree of parasitism at Piedimonte d'Alife, and Acerra, Italy.

REFERENCES TO LITERATURE.

- (1) Hymenoptera Ichneumonibus Affinum Monographie II, 1834, p. 172.
- (2) Hymenoptera Scandinaviae, Vol. V, 1878, p. 234.
- (3) Zeitschrift für angewandte Entomologie, 1915, Band II, Heft 2, p. 398.
- (4) Journal of Parasitology, Vol. II, 1919, p. 374.
- (5) 1911 Primo Contributo alla Biologia del *Phytonomus variabilis* Herbst., Boll. Lab. Sool. Agr. Portici, Vol. 5, p. 226-230.

A CHANGE OF NAME IN BUPRESTIDAE (COLEOPTERA).

By W. S. FISHER, U. S. Bureau of Entomology.

In the Proc. U. S. Nat. Mus., vol. 66, 1925, Art. 31, pp. 38-39, I described a species of this family from Bolivia under the name of *Taphrocerus parvus*. Recently I received from Dr. Jan Obenberger a copy of a paper (Sbornik Ent. Nár. Mus. Praze, vol. 2, 1924, No. 13, pp. 57, 76) in which he has described a species under the same name from Paraguay. Since the name given to the species from Paraguay by Dr. Obenberger has priority, I propose the new name ***Taphrocerus modicus*** for the species I described from Bolivia under the name of *Taphrocerus parvus*.

TWO NEW CHIGGERS (TROMBICULA LARVAE).

By H. E. EWING, U. S. Bureau of Entomology.

Each of the two new species of chiggers described in this short communication has a very unusual parasitic habit. One of them has been found only in the small axillary pouches of the front legs of an Indian gecko, and the other has the quite unusual habit of naturally parasitizing a tree toad. Few indeed are the ectoparasites that can find attachment to the smooth, slimy skin of an amphibian and endure the cutaneous acid secretions of these hosts. That this second species naturally infests the tree toad there can be no doubt for nymphs and adults have been reared from these amphibians captured in nature in a parasitized state.

Trombicula gymnodactyli, new species.

Specimens as a whole typical for the genus in size, shape and color. Mouth-parts smaller than usual. Palpi short, not reaching the tips of chelicerae, strongly down-curved. First palpal segment about three times as broad as long; second segment, or palpal femur, of about equal length and breadth, and but slightly swollen laterally; third segment slightly broader than long; fourth segment reduced and bearing the three-cleft palpal claw, which is longer than the segment bearing it and has the middle prong of its divided tip longer and stouter than the other two; fifth segment, or palpal thumb, small, short, not swollen, and bearing pectinate setae, some of which are over twice as long as the segment itself. Seta on palpal segment II with one or two barbs; seta on palpal segment III simple; setae on palpal segment IV either simple or with a single barb; some of the setae on segment V rather strongly pectinate. Chelicerae each with from five to seven sharp, recurved teeth above and four or five upturned, smaller teeth below. Eyes two each side, almost touching and almost equal. Dorsal shield small, with recurved setae and flagelliform and slightly pectinate pseudostigmatic organs. Number of dorsal abdominal setae about 24. Legs rather small and short, second pair slightly shorter than the other two pairs. Coxa I shorter than coxa II and bearing a single seta near its anterior margin; coxa II with a single seta which is situated near its posterior margin; coxa III shorter than either I or II, and with a single seta which is situated on the anterior margin near the base.

Length of engorged specimens, 0.52 mm.; width 0.30 mm.

Type host.—A Gecko, *Gymnodactylus lawderanus*.

Type locality.—Kooloo Valley, India.

Type slide.—Cat. No. 955, U. S. N. M.

Described from five specimens which were a part of a lot of many specimens that completely filled the axillary pits (mite pockets?) of the front legs of the host. The host specimen was taken in the Kooloo Valley, India, May, 1874, and bears the Museum of Comparative Zoology number 4803. It was sent to the writer for study by Joseph Bequaert, of the Department

of Tropical Medicine, of Harvard Medical School. This species is closely related to *Trombicula dentata* Ewing, from which it may be distinguished by having more ventral teeth to the chelicerae and fewer dorsal abdominal setae. *T. dentata* was described from specimens taken from a white-tailed deer and a cotton rat in the New World.

***Trombicula hylae*, new species.**

Larvae much longer than in the more typical species of the genus. Palpi rather slender, surpassing the chelicerae. First palpal segment about twice as broad as long; second segment longer than broad and not swollen; third segment slightly broader than long; fourth segment bearing the three-pronged palpal claw, the middle prong of which is much larger and longer than the other two; fifth segment, or palpal thumb, rather slender and not swollen. Seta on second palpal segment much longer than the segment itself and simple; seta on third segment long, simple; setae of fourth segment moderate and simple; some of setae of palpal thumb pectinate but two are simple in addition to a shorter spine-like seta which is simple. Chelicerae with peculiarly shaped arm. Instead of the arm being curved and claw-like it is almost straight, with an enlarged and flattened knob at the end. Above, this knob is recurved and bears a few irregular teeth. Galea small, with simple seta. Eyes two on each side, subequal, touching. Dorsal shield small, about as long as broad, front margin almost straight; behind, the shield is produced into a median angular process. Setae of dorsal shield six, in addition to the pseudostigmatic organs. There is a pair at the antero-lateral corners of the shield, a submedian pair near the front margin, and a pair at the postero-lateral angles. Pseudostigmatic organs short and apparently pectinate. Dorsal setae of abdomen about 26. Legs moderate. Coxa I with a single seta which is situated on the posterior margin just inside of spiracle; coxa II with a single seta which is on the anterior margin; seta on coxa III not observed.

Length of engorged specimen, 0.65 mm.; width 0.33 mm.

Type host.—A tree toad, *Hyla arenicolor*.

Type locality.—Cottonwood Creek, San Diego County, California.

Type slide.—Cat. No. 956, U. S. N. M.

Described chiefly from holotype specimen, which was one of many found infesting the ventral surfaces of tree toads of the species *Hyla arenicolor*. These toads were collected March 15, 1925, by L. M. Klauber, at Barrett Dam, Cottonwood Creek, San Diego County, California, and sent to the Division of Reptiles and Batrachians, United States National Museum. My attention was called to the infesting mites by Miss Doris M. Cochran. At present the writer is studying their very unusual habits of parasitism and will report on the same in a later paper. The nymphs have been reared in considerable numbers.

NEW SERPHOID PARASITES FROM NORTH AND SOUTH AMERICA (HYMENOPTERA).

By R. M. Fouts.

This paper contains descriptions of nine new species of Hymenoptera belonging to the families Scelionidae and Diapriidae.

Measurements are as in the author's recent paper published in the Proceedings of the Entomological Society of Washington, Vol. 27, 1925, pp. 93-103. Each division equals .0108 mm.

The specimens from New York were sent to me for identification by Mr. M. D. Leonard of Cornell University.

Unless otherwise stated, the types are in the author's collection.

Acerota leonardi, new species.

Male.—Length 1.23 mm. Length of head (dorsal view) 19, width 34; head rather roughly sculptured, scaly reticulate; lateral ocelli their width from the eye margin; pedicel a little less than twice as long as wide, longer and narrower than the third joint, which is slightly transverse; fourth joint nearly as long as the second and third united, a little wider than the third, slightly curved inwardly and rather sharply produced at apex on the inner side; joints five to ten subequal in length; joints seven, eight, and nine subequal, a little wider than long; tenth joint as long as the fourth, narrower, acute apically; sculpture on the thorax as on the head but much finer; length of thorax 40, width 31; length of anterior wing 95, width 40; wings slightly brownish; length of abdomen 55, width 24; length of second tergite 27; second tergite with two basal foveae, without distinct sculpture; black; antennae dark brown; coxae black; front legs light brown, the femora darker; middle tarsi and tibiae (except medially) light brown; posterior legs same color as middle pair.

Type locality.—McLean Bogs, N. Y.

One specimen collected by M. D. Leonard, May 16, 1925.

It gives me great pleasure to name this species after my friend, Mr. M. D. Leonard, of Cornell University.

This species is most closely related to *confusa* Ashm. The fourth antennal joint in *confusa* is about as long and as wide as the pedicel.

Platygaster nigricoxa, new species.

Body black; anterior tibia basally and apically, middle tibia basally, and all tarsi, pale brown; length of head 23, width 40, height 35; frons shining, with a few distinct transverse carinae below, above these striae to the middle of the face finely transversely wrinkled; upper part of frons finely shagreened; occiput finely striate medially, shagreened laterally; length of thorax 55, width 40, height 35; length of thorax behind apex of tegula 21; notauli complete; mesonotum entirely shagreened; median lobe sharply pointed posteriorly, the tip nearly touching the scutellum; scutellum circular, feebly convex, shagreened on anterior half, polished posteriorly; wings hyaline; length of front wing

(measured from apex of tegula) 130, greatest width 52; length of longest cilia on front wing 3; cilia on hind wing one-fifth the greatest width of the wing.

Female.—Length 3.02 mm. Scape as long as the terminal five antennal joints, finely longitudinally striate above, beset with short white hairs; pedicel about twice as long as wide, nearly as long as the following two joints united; joints two to five subequal in width; third joint shorter than the fourth, closely joined to the fourth, about as wide as long; fourth joint slightly longer than wide, subequal to the fifth; sixth joint as long as the fifth but somewhat wider; joints seven to nine wider than the sixth, distinctly longer than wide, slightly produced outwardly at apex; joint ten longer than joint nine, one and one-half times as long as wide, subacute apically; length of abdomen 130; dorso-lateral ridges on first tergite distinct but not prominent; median area on first tergite smooth, somewhat depressed across the middle; length of second tergite 43, width 33; foveae deep and broad, extending to basal three-sevenths, with several distinct striae inwardly, the latter not reaching beyond the apices of the foveae; interfoveal area suddenly narrowed anteriorly, smooth, without sculpture; length of third tergite 12, width (anteriorly) 32; length of the fourth tergite 19, width 24; length of fifth tergite 28, width 15; length of sixth tergite 20, width 13; sixth tergite triangular, sharply pointed at apex; tergites three to six without sculpture.

Male.—Length 1.10 mm. Third antennal joint about as wide as long, narrower than the fourth, closely joined to the fourth; fourth joint slightly widened apically, less than twice as long as wide; joints six to nine distinctly longer than wide; joint ten about twice as long as wide, blunt at apex; length of abdomen 75, width 40.

Type locality.—San Francisco, California.

Description based on two females and one male sent to me for identification by Dr. E. P. Felt. The notes accompanying the specimens were as follows: No. A 2723. Reared from a gall on Lupine produced by *Dasyneura lupini* Felt and received from San Francisco, Calif., May 13, 1916.

Allotype and paratype in Coll. U. S. Nat. Mus., Cat. No. 28497.

***Platygaster pallida*, new species.**

Male.—Length 1.75 mm. Length of head 23, width 39; frons strongly granular, transversely acuminate medially; occiput separated from the vertex by a sharp carina; occiput traversed by numerous small carinae; lateral ocelli their diameter distant from the margin of the eye; pedicel about as thick as the fifth joint, thicker than the third or fourth, twice as long as wide, slightly longer than the third; third joint more than twice as long as wide, shorter than the fourth; fourth joint as wide as the third, about three times as long as wide, not excised basally; joints seven to ten a little longer than wide; ten less than twice as long as wide, conical; length of thorax 55, width 35; mesonotum finely shagreened; notauli complete, indistinct anteriorly; median lobe of mesonotum rounded posteriorly, extending nearly across the scutellar fovea; scutellum circular, somewhat roughened dorsally, the actual sculpture more or less ob-

scured by the presence of numerous fairly long white hairs; length of abdomen 84, width (at apex of second tergite) 41; lengths of tergites as follows: 10, 44, 10, 6, 5, 4, 5; second tergite very strongly striate to apical one-fourth, polished laterally and apically; following tergites polished, without sculpture; second sternite very strongly sculptured to apical one-fourth; wings hyaline, with cilia; body and appendages yellowish-brown; metapleura, propodeum, second abdominal segment except laterally and apically, and last segment entirely, dark brown.

Type locality.—McLean Bogs, N. Y.

One specimen collected May 16, 1925, by Mr. M. D. Leonard.

The general color of the body and the sculpture of the abdomen distinguish the species. The structure and vestiture of the scutellum is also somewhat unusual. The pubescent scutellum recalls forms in the genus *Amblyaspis* but the hairs are less dense and the fovea is deep.

***Platygaster oenone*, new species.**

Female.—Length 1.35 mm. Length of head 17, width 32; frons mostly polished, with delicate aciculae laterally; antennal joints seven to nine very little longer than wide; length of thorax 40, width 27; mesonotum faintly shagreened; notauli distinct only posteriorly; scutellum short, circular, subconvex above, polished, sparsely pubescent, separated from the mesonotum by a deep constriction; length of second tergite 30, width 21; foveae short, shallow, a few striae extending past the middle of the segment; length of the third tergite 8, of the fourth 12, of the fifth 13, and of the sixth 11; width of the third tergite (at apex) 14, of the fourth 10, of the fifth 8; sixth tergite conical, acute apically; fifth tergite longitudinally striate medially; other tergites polished; wings hyaline; black; legs dark brown, the tibiae and tarsi lighter.

Type locality.—Revelstoke, Selkirk Mts.

Two females collected by J. C. Bradley, July 1, 1905.

Paratype.—In Coll. Cornell University.

This species is mostly closely related to *leguminicolae* Fouts. It differs in the structure of the antennae and the shape of the second tergite. In *leguminicolae* the second tergite is not distinctly longer than wide.

***Hadronotus variicornis*, new species.**

Female.—Length 2.07 mm. Length of head 40, width 90; head deeply and broadly excavated posteriorly, the upper margin of occiput very sharp; frons reticulated with raised lines, the areas averaging in size one of the ocelli; spaces between the raised lines with a faint sculpture; lateral ocelli their diameter distant from the margin of the eye; pedicel about as long as the third antennal joint, a little over twice as long as wide, scarcely narrowed basally; third joint slightly narrower than the pedicel, as long as the two following joints united; joints four and five subequal, as long as wide; sixth joint as long as the fifth

but a little wider; joints seven to twelve forming a club, all of them, except the twelfth, transverse; last joint longer than wide, longer than the penultimate, acute at apex; length of thorax 75, width 82; mesonotum and scutellum reticulated like the frons but with the ridges higher; mesonotum without notauli; length of abdomen 85, width 83; length of the first tergite 17, of the second 30, and of the third 22; first tergite with many small longitudinal carinae and with eight larger ones; one of these carinae on each side of the center and those at the extreme edge of the segment somewhat larger than the others; second tergite with strong carinae on basal one-third toward the middle; apical margin of segment polished, without sculpture; otherwise the second tergite is granular with a few small wavy longitudinal carinae; third tergite sculptured like the second but with the polished band at apex wider; tergites four and five granular, polished on apical edges, the polished area wider medially; last tergite very short, arcuately excised posteriorly; black; antennae, except last five joints, brownish-yellow; club joints black; legs stramineous.

Type locality.—Blairmont Plantation, British Guiana.

Described from four females reared by H. E. Box, August 18, 1923, from Hemiptera eggs collected on bamboo leaves.

Type.—Cat. No. 28498, U. S. Nat. Mus. Paratype in Coll. Fouts.

This species is most closely related to *H. minimus* Kieffer. It differs principally in having the first tergite more than four times as wide as long.

***Spilomicrus kiefferi*, new species.**

Female.—Length 3.4 mm. Length of head 52, width 54; body polished, except metapleura, propodeum, and first segment of abdomen; antennae 14-jointed, longer than the head and thorax united; scape much less than half as long as the flagellum; pedicel and third joint subequal, the former a little wider at apex, about twice as long as wide; joints to the eighth becoming gradually shorter and wider, the eighth about as wide as long; following five joints forming a distinct club, all the joints, except the last, transverse; fourteenth joint a little longer than wide, conical, acute at apex; length of thorax 98, width 65, height 57; notauli briefly but sharply indicated posteriorly; scutellum with two deep and broad foveae at base; scutellum behind foveae flat, transverse; propodeum with a conical prominence at base; first tergite about as wide as long, with strong ridges laterally; length of second tergite 100, width 67; second tergite elevated at base, without foveae or incisions; wings subhyaline; marginal nervure reaching margin of wing a little before the middle, a little longer than wide, longer than the radius; black; antennae, except last five joints, dark reddish; club black; palpi stramineous; legs reddish-brown.

Male.—Length 3.0 mm. Length of head 50, width 58; antennae thirteen jointed, considerably longer than the whole body, all the joints longer than wide and of uniform thickness; scape somewhat longer than the last joint; joints 3-12 inclusive subequal in length and width; last joint a little longer than the twelfth, five times as long as wide, acute at apex; length of thorax 100, width

65, height 57; notauli longer than in the female, extending to the middle of the mesonotum; thorax otherwise as in the female; length of first tergite 35, width 17; first tergite with many more or less distinct longitudinal ridges; length of second tergite 87, width 52; abdomen distinctly longer than the thorax; color, except of the antennae, as in the female; scape dull red; pedicel yellowish-brown; flagellum rather dark brown.

Type locality.—Saranac Lake, N. Y.

Described from ten females and two males collected, August 26, 1916, at Saranac Lake, and from one female collected, April 24, 1925, at Ithaca, New York.

Type and paratypes.—Two females in Collection Cornell University; one female and one male in Collection United States National Museum, Cat. No. 28499.

This species is named in honor of the distinguished entomologist Dr. J. J. Kieffer.

Cinetus pleuralis, new species.

Female.—Length 3.40 mm. Length of head 37 (.40 mm.), width 55; lengths of antennal joints: 40, 8, 24, 19, 19, 20, 17, 16, 15, 14, 14, 14, 13, 13, 16; all joints subequal in width, the third about five times as long as wide; second joint a little longer than wide, slightly wider than the scape; fifteenth joint blunt at apex; pubescence on antennal joints about as long as the joints are wide, semi-erect; length of thorax 90, width 56; carina on propodeum not divided; length of first tergite 40, width 14; first tergite of uniform width, with four longitudinal ridges, the two toward the center larger than the others; toward the apex are several small carinae between the ridges; length of second tergite 78, width 50; radial cell closed, about as long as the marginal vein, approximately three times as long as wide; marginal vein as long as the basal; head black; scape rufous; second and third antennal joints brown; flagellum piceous; thorax black, the pronotum and the venter rufous; petiole black; abdomen saffron-yellow except laterally where it is dark brown; legs yellowish-brown, the posterior tibiae and all tarsi somewhat darker.

Male.—Length 2.80 mm. Length of head 37, width 52; antennae rather long, filiform, with pubescence as in the female; lengths of antennal joints: 30, 6, 26, 20, 20, 19, 19, 18, 18, 18, 17, 16, 15, 18; third joint very deeply excavated on basal two-thirds, the cavity formed being deeper than the fourth joint is wide; width of third joint just behind the excavation 6; second joint slightly longer than wide, a little wider than the fourth joint; joints four to fourteen becoming gradually narrower; length of thorax 85, width 56; length of petiole 40, width 14; petiole sculptured as in the female; length of second tergite 76, width 53; scape yellowish, brown on the outer side toward apex; third joint yellowish, fuscous on the outer side; rest of antennae piceous; thorax colored as in the female; about half of second tergite (basally) and large spot medially on second sternite, saffron-yellow; abdomen otherwise black.

Type locality.—McLean Bogs, N. Y.

Two specimens collected by M. D. Leonard, May 16, 1925.

This species is closely related to *californicus* Ash. The abdomen in the latter species is uniformly dark brown. I have examined the type of *californicus* and find that it is a female.

***Belyta robustior*, new species.**

Female.—Length 3.70 mm. Length of head 63, width 56; pedicel as long as wide, a little over half as long as the third joint, as wide as the third; last joint as long as the third; pronotum narrowed neck-like anteriorly, not bulging outward laterally, with a median groove; pronotum a little over one-third the length of the mesonotum; median carina on propodeum divided at middle; lateral areas not sculptured; posterior angles more or less prominent, subacute; length of first segment 37, width 27; first tergite smooth, with four well defined longitudinal carinae; length of second tergite 100, width 74; median sulcus extending to basal third; a few short grooves on either side of the median sulcus; total length of abdomen 174; radial cell slightly longer than the marginal vein; black; palpi yellow; antennae rufous; legs reddish-yellow; wings brownish.

Type locality.—Glen Echo, Maryland (Coll. Fouts).

Described from one specimen from Glen Echo labelled, "June 5, 1921," and one specimen labelled, "Ithaca, N. Y., July 9, 1904."

Paratype.—In Coll. U. S. Nat. Mus., Cat. No. 28500

AN ADDITION TO THE SAPROMYZIDÆ OF THE DISTRICT OF COLUMBIA (DIPTERA).

By J. R. MALLOCH, *U. S. Biological Survey.*

In the Proceedings of the United States National Museum, Vol. 65, 1924, the writer, with W. L. McAtee, published a list of Sapromyzidae of the District of Columbia which contains records of 49 species. To this list may now be added *Sapromyza rotundicornis* Loew which was taken by the writer at Glen Carlyn, Va., in May, 1925. This species is essentially a northern one, occurring in New England and the Northwest, and its occurrence here is exceptional.

Actual date of publication, October 1, 1925.



BRAYTON HOWARD RANSOM

PROCEEDINGS OF THE
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In Memoriam

The following resolution was adopted by The Entomological Society of Washington on October 1, 1925:

Dr. Brayton Howard Ransom, Chief of the Zoological Division of the Federal Bureau of Animal Industry and for many years a member of the Entomological Society of Washington, died September 17, 1925, at the age of forty-six years. In his investigations in the broad field of animal parasitology, Dr. Ransom made frequent contributions to the subject of medical and veterinary entomology. His publications which have a direct bearing on Entomology include a wide range of subjects, such as: habits and biology of the Texas fever tick; arsenical dips for ticks; eradication methods for ticks; a nematode parasite of the house fly and certain dung beetles; miscellaneous cattle parasites; and sheep scabies. Perhaps his most comprehensive paper on insects is that published in Pierce's Sanitary Entomology. This paper deals with the relation of insects to the parasitic worms of vertebrates. The studies of arsenical dipping for the control of ticks conducted by Dr. Ransom and his collaborator, H. W. Graybill, are basic investigations of great economic importance.

Dr. Ransom was a man of great modesty and personal charm, a delightful friend and companion and a man of sound judgment and conservative ideas. His advice and counsel were highly prized by his associates and collaborators. His death at such an early age is a loss to Science and his friends. The Entomological Society of Washington regrets the loss of this active worker and wishes to record its sincere appreciation of the man and the scientist.

PYCNOSCELUS SURINAMENSIS LINNÆUS (ORTHOPTERA); ON ITS NYMPHS AND THE DAMAGE IT DOES TO ROSE BUSHES.BY A. N. CAUDELL, *U. S. Bureau of Entomology.*

The male of *Pycnoscelus surinamensis* Linn. has been recorded from the United States from a single specimen only, a winged individual taken in the Zoological Park in New York by W. T. Davis.¹ With this single exception the several hundred specimens of this roach recorded from America are females. Hebard, in his review of the United States Blattidae, mentions having examined over one hundred specimens from the United States and almost twice that number from other regions, chiefly Mexico and the West Indies, without finding a single male, either adult or immature. Davis also notes that the sixty-six adults in his collection are all females and all specimens in the National Museum are of that sex.

In looking over some fifty or more nymphs of this species I find many which might readily be mistaken for males; in fact I did this, and for a time was convinced they were of that sex, but was converted to the opposite view by Mr. Hebard. Dissections of dry and alcoholic material were made and the male-like individuals proved to be of early instars, the pseudo-male characters disappearing in the last nymphal instar. These early stage male-like nymphs are all smaller than those in the stage preceding maturity, but can generally be distinguished from the more typically female last instar nymphs by a casual examination of certain external characters. The younger nymphs have seven visible ventral abdominal segments. The apical segment extends laterally no farther than the bases of the cerci and the apical margin is mesially briefly notched at the termination of an almost or completely closed longitudinal slit which extends about one-half the length of this plate; on each side of this plate is a pointed subcylindrical style which is about three times as long as its basal width. In the last instar nymph only six ventral abdominal segments are visible, the apically incised terminal plate together with its pair of styles having wholly disappeared. This emphasizes the profound change which is undergone in the transition of the preultimate to the ultimate instar.

In a very few cases the small nymphs have the preapical sternite broadly rounded apically, instead of being transverse or slightly concave as usual, and almost or quite concealing the terminal plate. Such specimens, except for their usually smaller size, resemble almost perfectly the last stage nymphs; but in such cases the concealed terminal plate, which is less chitinated than when more fully exposed, may be seen by looking carefully beneath the covering segment from behind.

¹1919. Proc. N. Y. Ent. Soc., vol. xxvii, p. 108-109.

The ovipositor of the last stage nymph, which may be seen by raising or removing the apical ventral segment,¹ has the upper valves membranous, about three times as long as broad, the sides parallel and the tips broadly rounded; the lower valves are shorter and narrower. Posterior to and a little laterad of the ovipositor is a pair of subquadrate flaps which are apically and outwardly broadly concave and with a laterally directed tooth-like expansion on the outer margin at the apex. These flaps are thin and wholly membranous, and so inconspicuous as to be rather easily overlooked unless the observer knows of their presence; they are indicated in the accompanying figure 2 by the letter F, and may represent the lost seventh segment of the younger nymph as noted above.

In the earlier stage nymphs, lying above the base of the last ventral segment and wholly concealed by the preceding one, is the ovipositor, consisting of a pair of soft fleshy elongate flaps.

In all instars there is a pair of scarcely chitinized, but rather firm, thick plates beneath the supraanal plate, or last tergite. These plates are broadly notched apically and bear a few microscopic brown hairs. In nymphs of the last instar these plates lie next the ovipositor while in nymphs of earlier stages the style-bearing plate intervenes between them and the ovipositor. The accompanying figures illustrate the characters noted.

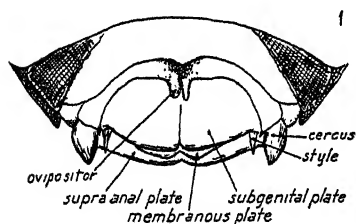


Fig. 1.

Pycnoscelus surinamensis Linn.
Tip of abdomen of early stage nymph, ventral view with segment preceding the last one, or subgenital plate, removed.

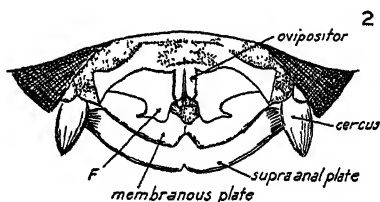


Fig. 2.

Pycnoscelus surinamensis Linn.
Tip of abdomen of last instar nymph, ventral view with terminal plate removed.

An interesting case of injury to rose bushes by this roach was reported by J. E. Koppelman, a florist of Providence, R. I. Under date of April 7, 1924, he wrote to the U. S. Bureau of Entomology, that beetles were destroying his rose bushes, especially young plants, by eating the bark from the stems a

¹Ordinarily in describing the genital organs of roaches the insect is presumed to be lying on its back, the position in which examinations are most readily made. Thus the positions mentioned in descriptions are usually opposite to those when the roach is in its natural position.

couple of inches beneath the surface of the ground. Specimens of the insect were submitted for determination and the supposed beetles turned out to be immature specimens of *Pycnoscelus surinamensis*. About twenty specimens were received, representing last stage nymphs and ones of earlier instars in approximately even numbers. They were kept alive in jars of soil for some time but unfavorable conditions ultimately caused all to die. When placed in a jar it was interesting to see them burrow immediately out of sight into the soil, in striking contrast to the behavior of ordinary roaches.

This roach has been reported from greenhouses for many years but its doing serious damage to rose stems seems to be a recent development, the first account of such damage being that by M. P. Zappe in 1918,¹ since which time there have been a number of similar instances noted. The last report was from the Florex Gardens of North Wales, Penna., where the roaches chewed off the bark of mature rose canes from a point well underground to a distance of several inches above ground. Thus this insect is fast becoming a pest with which rose growers will have to contend. The damage so far reported has all been done in greenhouses, but in our Southern States there appears no reason why it should not also work outdoors.

Since the above notes were written the roach in question has been reared from medium sized nymphs, through the stage preceding maturity and on to the adult form. A number of specimens were thus brought to maturity and all proved to be females. These bred specimens were kept isolated, both before and after maturing, and several produced young in from 37 to 101 days after attaining maturity, thus proving the long suspected fact that this species is parthenogenetic.

These breeding experiments verify the observations recorded in the above article. The number of nymphs in this species varies from 11 to 38 in several cases observed, though it is probable that the lesser number is due to some failing to emerge. That there may be more than the maximum here noted is shown by an ootheca removed from the abdomen of a specimen 64 days after maturing; this ootheca contained 48 eggs and filled the entire abdominal cavity, being 14.5 mm. long by 4.5 mm. broad, slightly curved and of a yellowish-white color. This shows the fully developed egg to be at least 4 mm. long. Eggs from the abdomen of a specimen which has just given birth to young are found in a bunch, but not inclosed in an ootheca; they are yellowish-white in color, slightly curved and vary from 1 to 2 mm. in length. The ootheca is rarely, if ever protruded from the abdomen of the roach. A young lady who attended

¹Bull. Conn. Exp. Stat., No. 203, p. 202-213.

the rearing experiments during a brief absence of the writer reports having seen a specimen with an ootheca protruding, but this observation needs verification.

The stage preceding maturity, that in which the female characters develop as detailed in the first part of this article, extends over a period of from 24 to 65 days in several cases definitely observed in the above rearing experiments. The duration of earlier stages was not determined.

These roaches are easily reared in cloth-covered glass jars containing a little soil in which they can burrow. The jars should be kept moderately moist and never allowed to completely dry out for any length of time. These roaches thrive on lettuce leaves, the only food used in the above rearings.

The young nymphs, when suddenly disturbed, often "play possum" for a brief period. They swim rather well, sometimes on the back but mostly back upwards. They will sit on a partly submerged bit of debris with just the tip of the abdomen projecting above the surface of the water; if completely emersed they remain quiet for a short time and then release their hold and rise to the surface.

A TENTATIVE ARRANGEMENT OF THE MUSCOID FLIES BASED ON THE PUPARIA.

BY CHARLES T. GREENE, *U. S. Bureau of Entomology.*

This tentative grouping of the muscoid flies correlates characters of the puparium with those of the adult, and is based on a study of about 400 species representing the families Tachinidae, Dexiidae, Sarcophagidae, Oestridae, Calliphoridae and Muscidae (this last including the Anthomyiidae). The principal adult character used is the arista of the antenna, whereas that of the puparium is the posterior spiracular plate. Both of these characters appear to be constant for a species.

The puparia may be divided into family groups and species on characters which, for the material available, are very satisfactory, but so far it has been impossible to find characters by which the puparia can be separated into genera. Certain few heterogeneous groups between the family and species can be defined but from this study of the puparia it would seem probable that too many genera have been made for the adults.

A large proportion of the species are parasitic in the larval stage and many others are simply scavengers. For convenience I have given a brief outline of the larval habits under each family. The plate shows the families arranged in tabular form with the drawings conventionalized but these show the characters very distinctly and may be easily used for purposes of determination. In all cases the right spiracular plate is drawn. The general treatment of the puparia is given under

each family. The puparium of all the species herein treated is formed from the larval skin.

The family Oestridae shows a very distinct form and for convenience I have placed it between two families which are quite distinct but exhibit a marked similarity of habits. The order of the arrangement of the families is similar to that used by the taxonomist in general but has no particular significance.

TACHINIDAE.

Adult with arista bare.

Puparium with the posterior spiracular plates either depressed slightly below the surface or placed at the apex of a protuberance which varies in length; each spiracular plate with two or more slits and always with a definite button. The location of the spiracle and the number of slits is constant for each species.¹

Larvae rather smooth; parasitic on other insects.

DEXIIDAE.

Adult with arista plumose.

Puparium like that of Tachinidae except that the spiracular plate always has three slits.

Larvae more rugose than those belonging to the family Tachinidae.

There is no distinct division between these two families; the adults are usually more slender and have longer legs.

GROUP A.

Adult with arista bare.

Puparium with a definite posterior cavity; spiracular plates located on the upper half of this cavity; each plate with three slits and always with a definite button.

Larvae like those of Tachinidae except in having the posterior cavity.

This group includes six genera: *Amobia*, *Amobiopsis*, *Hilarella*, *Metopia*, *Pachyophthalmus* and *Senotainia*. The adults in this group resemble those of the Sarcophagidae in appearance, but on account of the bare arista and the definite button on the spiracular plate, I consider them more closely related to the Tachinidae.

SARCOPHAGIDAE.

Adult with arista plumose basally, the apical third or more bare.

Puparium with a definite posterior cavity, with or without tubercles around the edge; spiracular plates located on the upper half of this cavity; each plate has three slits, always without a button.

¹An Illustrated Synopsis of the Puparia of 100 Muscoid Flies (Diptera) by C. T. Greene, Proc. U. S. Nat. Mus., vol. 60, 1921, Article 10, No. 2405, pp. 1-39, pls. 1-20.

The number and arrangement of the tubercles around the posterior cavity is constant for a species.¹

Larvae covered with minute spines; always with a posterior cavity having tubercles around the edge.

The larval habits are variable. Many species feed on carrion and some species feed on decayed vegetation, dead insects and dead mollusks. One species of *Sarcophaga* is found in the alimentary tract of man. The larvae of *Wohlfahrtia* have been found several times under the skin of infants and under the skin of several species of the lower vertebrates.

Several species, which have the arista bare, are included in this family, but nothing is known of their immature stages. I rather surmise that when the early stages of these are known they will fall in the preceding group A, which has the button on the spiracular plate.

OESTRIDAE.

Adult with arista bare, pectinate or plumose.

Puparium with a fold or depression at the posterior end; spiracular plates located in this fold or depression; each plate is either punctate or has three or more slits, and is with or without a button.²

Larvae with numerous heavily chitinated dermal appendages, which vary in number in the different genera. The larvae are parasitic on warm-blooded animals.

The available larvae belonging to this family may be divided into three groups on the character of the integument and the presence or absence of a button on the spiracular plate. In a general way these groups of the larvae correspond to the structure of the adult arista. The accompanying plate correlates the characters of the arista with those of the larvae and below is a list of the species belonging to each group.

GROUP A.

Adult arista bare. Larva with button present in the spiracular plate; dermal appendages spinelike.

Oestrus ovis Linné. The larvae are found in the frontal sinuses of the sheep.

Cephanomyia macrotis Brauer. The larvae are found in the throat of *Cervus macrotis*.

Cephanomyia cooki Townsend. The larvae are found in the throat of hogs.

A third species (no name given) has been reported to have been taken from a man's head.

¹The Puparia and Larvae of Sarcophagid Flies by C. T. Greene, Proc. U. S. Nat. Mus., vol. 66, 1925, Article 29, pp. 1-26, pls. 1-9.

²In the genus *Gastrophilus* the button is rather weak, but in the other forms it is either well developed or absent.

Hypoderma lineatum DeVillers. The larvae are found under the skin, on the back, of cattle.

Oedemagena tarandi Linné. The larvae are found under the skin of the reindeer.

Rhinoestrus nivarleti Rodhain and Bequaert. The larvae are found in the sinuses of a wild pig (*Potamochoerus porcus* Linné) of the African forest.

Gastrophilus equi Clark. The larvae are found in the stomach of the horse.

Gastrophilus haemorrhoidalis Linné. The larvae are found in the stomach, duodenum and rectum of the horse.

Gastrophilus nasalis Linné. The larvae are found in the duodenum and about the pylorus of the horse.

GROUP B.

The adult arista is pectinate. Larva with button absent in the spiracular plate; dermal appendages either cone-shaped (style a of plate) or scale-like (style b of plate).

The following species have very large, cone-like dermal appendages (style a):

Cuterebra americana Fabricius, a parasite on the jack rabbit.

Cuterebra buccata Macquart, a parasite on the striped squirrel, cats and in the throat of *Neotoma* sp.

Cuterebra cuniculi Clark. The National Collection has a larva found under the skin of a dog at Philadelphia. Larvae of this species have also been found in hares and rabbits from various states and have also been recorded from mice.

The following species has large; flattened, scale-like dermal appendages (style b):

Cuterebra baeri Shannon and Greene. The larvae of this species infest the red howling monkey (*Alouatta* sp.), the infestation being mainly around the throat. The specimens in the National Collection were collected at Kartabo, British Guiana, by Professor Alfred Emerson and at Darien, Panama, by the late J. L. Baer. Certain of these emerged from a monkey July 12, 1924, pupated on the 13th and the adult emerged July 22, 1924.

GROUP C.

Adult arista pectinate.

Puparium. I do not have any specimens of this genus.

The larva is rather distinct in form, having the anterior portion quite slender and neck-like, while the posterior portion is quite globular; the large spines are located on this globular portion; each spiracular plate has three parallel slits and lacks the button.

Dermatobia hominis Linné. The larvae are found under the skin of man, monkeys and dogs.

CALLIPHORIDAE.

Adult arista plumose with the apical fourth bare; the body of the adult is usually a metallic blue or green.

The puparium exhibits three forms; in all of these the spiracular plate is usually small, and is located either slightly below the surface of the puparium or raised decidedly above the surface, but never tuberculate; each plate has three slits and a button.

Section 1.—Puparium smooth, posterior end rounded, with upper half slightly oblique. In *Chrysomyia* there is a transverse fold on the posterior end.

The majority of the puparia of this family belonging to this section and this section includes the majority of the puparia found in the genus *Chrysomyia*.

Protocalliphora belongs to this group and is parasitic on nestling birds.

Section 2.—Puparium smooth, with the posterior end slightly depressed; spiracular plates located in this depression.

The genus *Philornis* belongs here and is parasitic on nestling birds.

Section 3.—Puparium smooth, with pointed tubercles arranged in rows, and with the posterior end slightly oblique.

Several of the Australian species of *Chrysomyia* constitute this form and are troublesome in the sheep-growing section.

The majority of the larvae belonging to the Calliphoridae are scavengers in carrion and decayed material. In the genus *Chrysomyia* the larvae are often found in infected sores, and they are also troublesome in the sheep-growing sections. The parasitic genera are mentioned under sections 1 and 2.

The families Calliphoridae and Sarcophagidae are very similar in the form of the adult arista, and in the larval habits, but may be easily distinguished by characters found on the larva and puparium. So far as known the parasitic forms of Calliphoridae parasitize only nestling birds, whereas the Sarcophagidae parasitize insects and higher animals but never the birds.

MUSCIDAE.

(Including ANTHOMYIIDAE.)

Adult arista bare, pubescent, pectinate or plumose.

The puparium exhibits four different forms, all of which have the spiracular plates raised above the surface; each plate has three slits and a button.

Section 1.—The adult arista exhibits all four styles.

The puparium, which I call the "general form," has the posterior end slightly oblique, with the spiracle, fig. 1, slightly raised above the surface and located on an oblique surface.

The common house-fly, *Musca domestica* Linné, the stable-fly, *Stomoxys calcitrans* Linné, the horn-fly, *Haematobia irritans* Linné, and the cluster-fly, *Pollenia rudis* Fabricius, belong to this section.

The larvae breed commonly in manure, human excrement and sometimes in decayed vegetation.

A few species in the genus *Pegomyia*, which also belong to this section, are leaf miners. *Hylemyia cilicrura* Rondani mines in the stems and roots of cabbage, radish, beans, onions, beets, potatoes and hedge mustard.

Section 2.—Adult arista, style a.

The puparium has the posterior end oblique, deeply depressed; posterior spiracles, fig. 2, slightly raised above the surface and located in this depression.

The larvae breed commonly in cow manure.

Morellia micans Macquart belongs to this section.

Section 3.—Adult arista, style c.

The puparium has both ends truncate; posterior spiracles, fig. 3, decidedly raised above the surface.

The larvae breed commonly in decayed vegetation.

Atherigona pulvinata Grimshaw belongs to this section.

Section 4.—Adult arista, style c.

The puparium has the form of the larva; there are pointed processes arranged in a single row on the lateral edge, and a double row in the middle of the dorsum; posterior spiracles, fig. 4, decidedly raised above the surface, and located on the dorsum of the last segment.

The little house-fly, *Fannia brevis* Rondani, belongs to this section.

Most of the larvae of the family Muscidae are scavengers, but a few species, which are noted under their particular section, are leaf and stem miners.

EXPLANATION OF PLATE 10.

Diagram showing a comparison of the adult arista with the type of puparium and the spiracular plate of the puparium. Wherever more than one type of arista is found in any family the variations or differences in the puparium or the spiracular plate, which are correlated with these different types of arista, are designated by the same letter.

FAMILIES									
PARTS	TACHINIDÆ	DEXIIDÆ	SARCOPHAGIDÆ	CESTRIDÆ	CALLIPHORIDÆ	MUSCIDÆ (ANTHOMYIDÆ)			
ARISTA	bare	plumose	plumose tip bare	A bare B plumose C pectinate	plumose tip bare	A plumose B pectinate C pubescent D bare			
PUPARIUM						1 2 3 4			
SPIRACULAR PLATES									
GROUP A <i>Amobia, Amobiosis, Hilarella, Metopia, Pachyophthalmus, Senotainia</i>									

THE SYNONYMY AND GENERIC POSITION OF TWO NORTH AMERICAN ICHNEUMON-FLIES.

BY R. A. CUSHMAN, *U. S. Bureau of Entomology.*

In the Canadian Entomologist, vol. 57, 1925, p. 104, Viereck takes issue with Cushman and Gahan's treatment of *Banchus fugitivus* Say.¹ He contends that *Limneria guignardi* Provancher and *L. oedemasiae* Ashmead, synonymized by Cushman and Gahan with *fugitivus*, can not be synonymous with that species because they spin their cocoons within the skin of the host caterpillar, whereas Say's species spins a naked cocoon; because *guignardi* and *oedemasiae* have the abdomen gradually clavate, not "abruptly clavate" as in *fugitivus*; and because Provancher's and Ashmead's species have the posterior tibiae white at extreme base, not black.

The first reviser of the species was Riley², who identified as *fugitivus* certain parasites of *Euchaetes egle*. The specimens on which this determination was probably based are in the National Museum, and, in my opinion, are conspecific with a homotype (Gahan) of *guignardi* Provancher, with the types of *oedemasiae* Ashmead, and with specimens reared from various species of *Malacosoma* and *Anisota*. In connection with the above named hosts the name *fugitivus* has been placed in print many times, in both taxonomic and economic literature; and I believe that this interpretation of the name should be preserved unless much stronger evidence that it is erroneous is presented than that brought forward by Viereck.

In the first place, I believe that Say's description is based on two species, for he says "in the male the white of the posterior tibia is less obvious," which is certainly not true of any species of the group known to me, though the reverse is sometimes true.

A careful perusal of Say's description will show that he did not specify which of his specimens came from the maculated cocoon or of which sex was this specimen, but "I obtained a specimen (the italics are mine) from a very pretty cocoon which is somewhat cylindric, white with two maculated black bands." He did not know from what sort of cocoon his other specimen or specimens came.

Say's description of the shape of the abdomen is as follows: "abdomen arcuated; towards the tip rather abruptly clavate." In dorsal aspect *fugitivus* in the sense of Riley does not have the abdomen "abruptly clavate," nor is the abdomen "arcuated"; but in profile it is both "arcuated" and "rather abruptly

¹Proc. Ent. Soc. Wash., vol. 23, 1921, p. 159.

²First (1869, p. 139) and Fourth (1872, p. 41) Annual Report on the Insects of Missouri.

clavate," and it is obviously in profile that Say was describing it.

As for the black base of the hind tibia Say says, "posterior tibiae white with black tip and base." It would not be at all surprising if Say had overlooked the fact that the extreme base of the tibia in his specimens was white, which he almost certainly did, for I know of no species of "*Limneria*" possessing an annulated tibia in which the extreme base is not white.

Except for the almost certainly non-existent difference in the color of the hind tibia, Riley's parasite of *Euchaetes egle* disagrees in no way with Say's description.

There exists, as I see it, no necessity for changing, and for the following reasons I believe it unwise to change the meaning of *fugitivus*, and decline to follow Viereck in his interpretation of the species: the name of *fugitivus* has appeared repeatedly in the literature of several important and often referred to economic insects, and in this connection has become almost as widely well known as the host insects; in this sense the species fits the original description, with one minor difference that probably does not exist; in this sense also the species is represented by specimens in many museum and private collections; and the genus *Ameloctonus* Foerster (with *fugitivus* as type by fixation of Viereck himself) is typified by a well-known species. If, on the other hand, the course suggested by Viereck be followed one would have always to remember that in economic and taxonomic literature up to 1925 *fugitivus* does not mean *fugitivus* but *guignardi*; the species would not, for the present at least, be represented by identified specimens; and the genus *Ameloctonus* would be unrecognizable.

So convinced am I that my course is the wiser one that I venture to designate a neotype of *fugitivus* as follows:

***Hyposoter fugitivus* (Say).**

Synonymy as given by Cushman and Gahan, Proc. Ent. Soc. Wash., vol. 23, 1921, p. 159.

Neotype.—A female specimen from the collection of C. V. Riley, reared from *Euchaetes egle* Drury, and now in the collection of the U. S. National Museum.

Viereck's paper causes considerable confusion from the generic standpoint. Viereck himself has fixed the genotypes of *Horogenes* and *Hyposoter* by referring a single species to each and of *Ameloctonus* and *Anilastus* by selection, while *Hypotherentes* and *Ischnoscopus* are monobasic on Ashmead's inclusion of species. As pointed out by Viereck, Gahan has synonymized the last four with *Hyposoter*. While not stating whether he accepts or rejects this synonymy, Viereck synonymizes *Hyposoter* with *Horogenes*. But *Horogenes* has as its genotype by Viereck's own designation *Limnerium* (*Horogenes*) *discoocellellae* Viereck,

which is an *Angitia*. *Horogenes guignardi* (Prov.) is not congeneric in the strict sense with *Horogenes discoocellellae* Viereck. The next oldest generic name of the series is *Hyposoter*, and to this, for the present at least, *guignardi* must be referred.

Horogenes (Foerster) Viereck = *Angitia* Holmgren.

As for the relative value of the existing generic names in this group it appears to me that this is a matter of personal opinion and convenience.

In "The Cresson Types of Hymenoptera" (Memoirs Am. Ent. Soc., No. 1, 1916) Cresson did not indicate which of the two specimens, representing opposite sexes, should be considered the holotype of *Limneria rivalis*. His statement "♂ abdomen gone" is not to be taken as type selection, for he is here merely quoting from Crawford and Rohwer's statement regarding the condition of the Cresson types in the National Museum. Inasmuch as the two specimens are not of the same species it is highly important that one be designated as the holotype. Since the first characters mentioned in the original description by which the sexes are said to differ are of the female, and since the male is that of *Hyposoter pilosulus* (Provancher), a species widely published in taxonomic and economic literature, it seems best that the female be selected as the holotype. This is hereby done. Both specimens are in the National Collection and both lack the abdomen.

Because of its convergent eyes *rivalis* is referable to the genus *Cymodusa* Holmgren, of which it is by no means a typical example, since the eyes are apparently hairless and the convergence of the eyes is much less marked than in such species as *distincta* (Cresson). The following is the corrected synonymy:

***Cymodusa rivalis* (Cresson).**

Limneria rivalis Cresson, Trans. Am. Ent. Soc., vol. 4, 1872, p. 161, ♀ not ♂.

***Hyposoter pilosulus* (Provancher).**

Limneria rivalis Cresson, Trans. Am. Ent. Soc., vol. 4, 1872, p. 161, ♂ not ♀.

Limneria pilosula Provancher, Add. Faune Ent. Can. Hym., 1889, p. 89, ♀ ♂.

Limnerium pilosulum Dalla Torre, Can. Hym., 1901-1902, p. 101.

Limneria ephestiae Ashmead, Trans. Am. Ent. Soc., vol. 23, 1896, p. 195, ♀ ♂.

Limnerium ephestiae Dalla Torre, Cat. Hym., 1901-1902, p. 95.

Amorphota perrivalis Viereck, Trans. Kans. Ac. Sci., vol. 19, 1905, p. 307, ♀.

Campoplex (Ameloctonus) pilosulus Viereck, Hym. Conn. (1916), 1917, p. 267.

Campoplex (Ameloctonus) pilosulus Tothill, Can. Dept. Agr. Bull. 3, n. s. tech., 1922, p. 59-74, pl. 3, fig. B, pl. 5, figs. 29-35, 37-57.

The above synonymy is based on the allotype of *rivalis*, a homotype (Gahan) of *pilosulus*, the types of *ephestiae*, and a homotopotype of *perrivalis*, all of which are in the National Collection.

A NEW ENCYRTID PARASITIC IN THE EGGS OF MONEILEMA
(HYMENOPTERA: CHALCIDOIDEA).

By A. B. GAHAN, U. S. Bureau of Entomology.

The egg-parasite described below was reared in connection with the prickly pear insect investigations being carried on by the Commonwealth of Australia at Uvalde, Texas, and was sent to the Bureau of Entomology for identification by Mr. A. P. Dodd.

Ooencyrtus moneilemae, new species.

This species has the mesoscutum less strongly sculptured than any of the other American species and it also differs from all of them in that the legs including all coxae are pale reddish testaceous.

Female.—Length .83 mm. Head as broad as thorax; frontovertex moderately broad, approximately twice as long as broad, weakly reticulate and slightly shining; ocelli in a nearly equilateral triangle; eyes faintly pilose, diverging anteriorly; scape slender; pedicel almost twice as long as thick at apex; first funicle joint about half as long as pedicel and somewhat longer than broad; second funicle joint usually very slightly longer than the first, joints 2 to 6 subequal in length but successively increasing very slightly in thickness, the sixth subquadrate; club ovate, about equal in length to the three preceding funicle joints and nearly twice as thick as last funicle joint; mesoscutum broader than long, very faintly reticulated, nearly smooth and shining, sparsely set with evenly distributed short fine hairs; scutellum basally sculptured like the mesoscutum, the apical half smooth and highly polished; mesopleura weakly reticulated; stigmal vein very slightly longer than marginal, the latter about as broad as long; disk of wing uniformly ciliated but with a distinct hairless line extending obliquely inward and backward from the stigmal vein nearly to the posterior margin but closed before reaching the margin; abdomen broader than long, subtriangular, not longer than the thorax and faintly reticulated dorsally. Head and thorax black with a very slight bronzy tinge in some lights; abdomen blackish apically and laterally, the base and middle brownish-testaceous above and below; antennae dark brownish-testaceous or fuscous; legs including all coxae pale reddish testaceous; wings uniformly slightly fuscous, venation dark brown.

Male.—Length .6 mm. Similar to the female but the antennae more distinctly hairy, the funicle joints subequal and submoniliform, the first as long as pedicel and twice as long as broad, the second and following subequal in length to the first but a little broader; club solid, about as long as two preceding joints and scarcely thicker than funicle; abdomen entirely black or at least not conspicuously paler at base.

The pale spot at base of female abdomen is somewhat variable in extent, being reduced to a pale transverse basal band in some cases.

Type locality.—Uvalde, Texas.

Type.—Cat. No. 28520, U. S. N. M.

The type female and five paratype females reared by A. P. Dodd in October, 1924, from eggs of *Moneilema* sp. at Uvalde, Texas; twelve females and nine males from eggs of the same host from the same locality in October, 1922, by E. Mortensen. A female and two males of the last series are slide-mounted.

NOTES ON THE GENUS *OBRIMA* WALKER IN THE U. S.
(LEPIDOPTERA: PHALAENIDAE; EREBINAE).

BY WM. BARNES AND F. H. BENJAMIN, *Decatur, Illinois*.

OBRIMA Walker.

Type.—*Obrima pyraloides* Walker.

Obrima Walker, Cat. Lep. Het. Brit. Mus., Vol. 9, 1856, p. 135. (*pyraloides* sole species and therefore type.)

Obrima rinconada primaensis Barnes & Benjamin.

Obrima pimaensis Barnes and Benjamin, Proc. Ent. Soc. Wash., Vol. 27, 1925, p. 126.

Obrima rinconada Schaus (Trans. Amer. Ent. Soc., Vol. 21, 1894, 240) was described from Rinconada, Mexico.

Since describing *pimaensis* from six males received from O. C. Poling, Baboquivari Mts., Pima Co., Arizona, we discovered in a box of unsorted material a single male labeled So. Arizona, much darker and with pronounced black irrorations on the primaries.

Remembering that a specimen of *rinconada* which Dr. Schaus had loaned to us was very similar, we submitted to him the Southern Arizona specimen. He informs us that it is quite typical.

At the time we described *pimaensis* we pointed out that it would probably ultimately sink to a subspecies of *rinconada*, but as *rinconada* was only known from the dark irrorated specimens from the neotropics, we did not wish to add the name to our lists.

We see no reason to doubt the locality label on the single specimen of typical *rinconada* before us, nor can we see any real specific differences between it and the types of *pimaensis*, although the superficial differences pointed out in the original description of *pimaensis* are as great as those usually assigned specific rank in the Erebinæ. However, as long as typical *rinconada* has been found in Arizona, we prefer to consider *pimaensis* a subspecies rather than a species.

Actual date of publication, November 27, 1925.



WALTER DAVID HUNTER.

PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

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In Memoriam

The following resolution presented by a committee composed of L. O. Howard, C. L. Marlatt, F. C. Bishopp and August Busck, was adopted by the Entomological Society of Washington at its regular meeting on November 5, 1925:

The announcement of the death of Dr. Walter David Hunter has caused the members of the Entomological Society of Washington to sorrow very deeply. Although seldom present at our meetings of late years, Doctor Hunter was the dear friend of many of us, and all of us respected him and admired him for his notable achievements in applied entomology. We realize that by his work and his sound judgment and by his high character as a man, he had gained the confidence of the people, especially of the South, to an unparalleled degree. We realize further that he has had a most important influence in the awakening of a realization of the very great value of entomological work. No memorial could express adequately the value of his life work, and we can only grieve with others that blind fate should have stopped it in mid career.

The Society authorizes the preparation of a biographical account of Doctor Hunter and its publication together with his bibliography in the Proceedings of the Society.

WALTER DAVID HUNTER, LL. D.

BY L. O. HOWARD.

Dr. W. D. Hunter, President of the Entomological Society of Washington for the year 1915, was born at Lincoln, Nebraska, December 14, 1875, and died suddenly at El Paso, Texas, October 14, 1925. His father's family were of that sound Scotch stock that moved to the north of Ireland on account of religious persecution. His father's parents came to America about 1825, settling first at Perry, New York, afterwards moving to Rockford, Illinois, and the family moved later to Lincoln, Nebraska. His mother's people were of Scotch-English origin, and came to America about 1635. One of his grandmothers was a descendant of Robert Cushman, who came over on the Mayflower.

Hunter's father, who was a lawyer and ranked high in his profession, died, a young man, in April, 1880, when our former President was four years old. He entered the preparatory school of the University of Nebraska at the age of fourteen, and graduated from the University with the degree of A. B. in 1895, before his twentieth birthday.

There were four children in the family (Walter being the second), and all seem to have been born naturalists. Their mother (who is still living in Lincoln) writes me that Hunter's field work was begun long before he entered the University. She states: "There was not a fence corner within eight miles that the children did not know what birds, plants and insects could be found there. Eight miles was about the limit of our old white horse. Later on they extended their knowledge on foot many miles more."

In the University, he soon began work under Prof. Lawrence Bruner, first on ornithology and taxidermy, but he was soon led by this teacher's enthusiasm into a close study of insects. He seems to have been the most capable and promising of Bruner's students, since he stayed with him after graduation and became an instructor, continuing his work all the time and receiving the degree of Master of Arts in 1897.

His first paper was published during his first post-graduate year (1896) and was entitled "A Contribution to the Knowledge of North American Syrphidae." It constituted the leading article in the *Canadian Entomologist* for April of that year. It included careful description of four new species, with lengthy notes upon a number of other forms. There was nothing amateurish about the article, and it showed a grasp of the subject and a knowledge of the literature worthy of a much older and more experienced worker. This was followed by three other papers—two in the *Canadian Entomologist* and one in

Entomological News—all dealing with the Syrphidae. The final one, published in June, 1897, covers 22 pages and is again the leading article in the *Canadian Entomologist*. Apparently Doctor Bethune, who was at that time the editor of that journal, believed that he had found a new writer of importance.

Recently Doctor Hunter is reported to have spoken slightly of this early work, but it was nevertheless of an excellent character. The habits of close and careful study and of a full search of the literature, which he acquired in this early work, stayed by him in later years and characterized all of his economic investigations. He was distinctly a research man all his life, although, as will appear, he broadened out into an administrator and a man of large affairs.

His work as an instructor and as Bruner's righthand man led him quickly into applied entomology. For several years the entomological service of the federal Department of Agriculture had been employing Professor Bruner to make trips each summer throughout the far west to study grasshopper conditions in order to get early knowledge of the possibility of the development of swarms of *Melanoplus spretus* which might fly out and devastate the western crops as they had done at widely separated intervals for many years. The South American migratory locust (*Schistocerca paranense*) had been doing enormous damage in certain South American countries, notably Argentina, and the Merchants' Locust Investigation Commission of Buenos Aires, through the Argentine diplomatic representatives at Washington, applied to the Department of Agriculture for an American expert to go to Argentina to make the necessary studies and to advise them as to procedures. Bruner was chosen, and left Lincoln early in 1897, leaving Hunter in charge of the Nebraska work. Therefore, in the summer of that year Hunter was commissioned to make the reconnaissance grasshopper trip through the western States. He did this work so well that he was recommissioned in the summer of 1898 to make an especial investigation to determine whether *Melanoplus spretus* breeds permanently in the Turtle Mountains in North Dakota. Professor Bruner returned from Argentina in 1898, and resumed charge of his department at Lincoln, Hunter continuing to act as his assistant.

In 1900 the Supreme Court of Nebraska rendered a decision by which the State University was deprived of certain incomes, and the regents economized by cutting out as many assistants as possible and by reducing expenses in every way. All of Professor Bruner's assistance was cut off, and Hunter was left on the 1st of July without a position. It happened that just at this time Prof. H. E. Summers, Entomologist of the Iowa State College of Agriculture at Ames, needed an assistant, but could pay only four hundred dollars a year. Hunter could have

gone into teaching with four times this salary, or he could have listened to the urgings of relatives and gone into commercial work at a good salary, and his mother wanted him to be a lawyer as his father had been (in fact he studied law for a short time in the office of his father's partner), but, as he wrote at the time, he had seen so many men leave science, temporarily as they thought, to make a little money, who were never able to get back to scientific work, that he decided to accept the sacrifice and stay in the work he loved even at a rate of compensation which, while it might buy him bread and butter, would do little more.

In the meantime the cotton boll-weevil problem in south Texas was becoming very serious. Investigations had been made by the federal service in 1895 and 1896 without especial appropriations. In 1897 the State of Texas made a specific appropriation and appointed Mr. F. W. Mally in charge. The boll weevil, however, continued to spread, and in the winter of 1900-1901 it became obvious that the federal government would be called upon to assist and that Congress would appropriate for this purpose. Therefore it was necessary to find a competent entomologist to place in the field. Hunter, on account of the excellent record he had made in his summer investigations of 1897 and 1898, was chosen and came to Washington early in March, 1901. He had received rather definite assurances of his appointment in January and had spent two months in an intensive study of cotton culture and the cotton insect problem. He was sent at once to Texas, and during the next few months traveled extensively over the State, especially in the regions invaded by the weevil, and accumulated a mass of information, not only about the weevil itself but about cotton in general, Texas conditions and the people of the State. He surrounded himself with the Texas atmosphere and imbibed it until, with extraordinary adaptability, in the course of a few months he had become a Texan and a cotton expert.

After thorough investigation lasting many months, he established headquarters at Victoria, Texas. Urgent efforts were made by interested persons to have him choose Wharton, a larger city to the east. He defended his judgment and was backed by the Chief of the Bureau and by the Secretary of Agriculture in spite of the fact that pressure was brought to bear even upon the President of the United States to secure the change.

At Victoria he began slowly to add to his force until, with the progress of the weevil to the north and to the east it became advisable to change headquarters to Dallas. This latter move was made in 1905, after the weevil had crossed into the State of Louisiana.

While at Victoria Dr. Hunter married Mary P. Smith,

daughter of Dr. E. H. Smith of that city. Mrs. Hunter is still living.

Among the young entomologists who have since become very well known and who were associated with Doctor Hunter at the time of his move were Dr. W. E. Hinds, Dr. A. W. Morrill, Mr. J. C. Crawford, Dr. W. A. Hooker, Mr. W. W. Yothers, Mr. A. C. Morgan, Dr. W. D. Pierce and Mr. C. E. Sanborn. To this list during the following year were added Mr. F. C. Bishopp, Mr. F. C. Pratt, Hon. J. D. Mitchell and Mr. R. A. Cushman. Mr. Wilmon Newell, at that time holding an official position under the State of Louisiana, was engaged as a paid collaborator. Later C. E. Hood, E. S. Tucker, T. E. Holloway, G. T. Smith, G. N. Wolcott and B. R. Coad (to mention only those who have become especially well known) became associated with the work.

In 1909 a laboratory was started at Tallulah, Louisiana, which has since become the main laboratory of the cotton boll weevil investigation, the Dallas station being abandoned for this purpose.

During all this time the most intensive work was going on. Every phase of the biology of the weevil was studied; its ecology (although they did not call it by that name) was investigated carefully in several of its phases, and an enormous amount of experimentation with different remedies and machines was done. It was early found out that planting early-maturing varieties, hastening boll production, and fall destruction of the plants together formed the most practical plan that the cotton planters could adopt. To prove this, large areas of cotton land were secured and broad-scale experiments were carried out which should have proved the feasibility of the plan to the most prejudiced. Publicity was given to this experimental work, but planters were so bound to their traditional methods that little headway was made in bringing about its adoption. Had the early recommendations of Hunter and his force been generally adopted in Texas (and in Louisiana as well), the spread of the boll weevil would have been very greatly retarded and an enormous monetary loss would have been saved.

Realizing that every effort should be devoted to the boll weevil alone, Hunter was instructed to discourage general collecting by his force, but, as he once said, "What are you to do? With a lot of enthusiastic entomologists coming suddenly into a region with a fauna and flora absolutely novel to them, you can't keep them from collecting." He was perfectly right. For several years all of these men were northerners. They had never seen many of the insects that were flying about them, that came to their lamps at night, that crawled over their working tables, that even got into their food at dinner. To them it was like picking up rare jewels. They could not help collecting them.

And as the force grew there was a definite collection, and it grew and grew—one can hardly say without effort, for there was an effort, but it was the other way. Eventually when F. C. Pratt joined the force his great skill as a collector and mounter of insects was brought into play, and later a whole room full of Schmitt boxes of Texas insects was sent to the National Museum in Washington. It seemed to be one of the largest and most varied State collections in existence.

This is hardly the place to enter at all fully into the details of the successes or non-successes of the cotton boll weevil investigation. It has been a very wonderful work. The spread of the boll weevil over the cotton belt of the United States was a dramatic happening which would have been pure tragedy had it not been for the work of Hunter and his assistants. That the problem has now been so nearly solved that the Cotton Pest Committee of the Association of Southern Agricultural Workers has just disbanded, is due largely to the initiative of Hunter and the impetus which his keen interest, his unflagging labor and his wise direction gave it from the beginning.

As soon as Hunter's great ability became plain, other burdens were put upon his shoulders. His work was expanded, at first to include the insects affecting southern field crops in addition to cotton, and investigations were begun on the insects affecting rice and tobacco and sugar cane. A little later he became greatly interested in medical entomology, at first with the carriage of Texas fever by ticks, a little later the study of the Rocky Mountain spotted fever carried by other ticks, still later questions relating to the house fly and to the disease-carrying mosquitoes. This interest and his studies led him to prepare, as retiring President of the Association of Economic Entomologists, an admirable address entitled "American Interest in Medical Entomology." Still later, he used an allied subject, "Some Observations on Medical Entomology," as the subject of his retiring address as President of the Entomological Society of Washington. Nothing better than these two addresses has been published on this general subject. They showed a breadth of reading and an insight into future possibilities that seemed marvelous to his hearers at the time and to those who read the addresses to-day. A great deal has been written on medical entomology during this first quarter of the twentieth century, but I know of no one comprehensive paper that shows a broader grasp of the subject, a sounder outline for future study, or a surer prophetic touch than the 1915 address before this Society.

A probably complete bibliography of Doctor Hunter's writings which has been drawn up by Miss Mabel Colcord, the Librarian of the Bureau of Entomology, follows this article. Looking through the titles, it is obvious that he displayed a

good life's work in print. Some of the papers are of very great value. All of them are sound. No list of a man's writings, however, shows more than one side of his accomplishments. His influence as an individual is a thing apart from his writings; and to those of us who knew him it comes more and more since his death that he was in many ways a very remarkable man.

The final years of his life were largely devoted to the vitally important problem of how to prevent the pink boll worm from establishing itself in a disastrous way in the cotton fields of the South. As a member of the Federal Horticultural Board whose function it is to take care of these questions of quarantine, he assumed a sub-permanent residence in Texas and had charge of the active prosecution of the campaign against this dreaded pest. He found himself in a position which demanded all of his technical knowledge, all of his tact, all of his firmness and honesty of purpose, and all of the substratum of strong friendships and public respect which he had gained during his quarter of a century in Texas. To those who have even a slight knowledge of the conditions and of the opposition which he met from many sources, his success has been most noteworthy.

While engaged in this work Hunter had associated with him Mr. F. S. Puckett, who is at the present moment acting in charge of the pink boll-worm field service of the Federal Horticultural Board. In a recent letter Mr. Puckett has expressed his judgment of Doctor Hunter in a very clear and forceful way, and, coming from a man who had been his intimate associate for a number of years, three of Mr. Puckett's paragraphs may well be quoted:

"Doctor Hunter's methods and plans of operation in quarantine work were always logical, free from unreasonably drastic or strictly experimental courses, constantly keeping in mind the least possible disturbance of normal business relations commensurate with safety. He was farsighted, open to conviction, invited counsel and firm in his conclusions.

"A recognized student with a remarkable memory, always in possession of all available information concerning any subject under discussion, he was a leader in any assembly that he attended and by force of character and of ability to constantly see the main issue, unclouded by details, impressed others with his views and conclusions.

"With his associates he was genial, approachable, interested in them and their affairs and a teacher, yet so fully impressed them with his earnestness, high order of courage and resourcefulness that there was inculcated in their minds a determination to succeed in their assignments. Never discouraged but calm and collected at all times and under the most extreme conditions, resourceful with absolute power of concentration and a great organizer, he could invariably discern all the forces available to attain a desired result; his quick reading of men and instant grasp of the subject enabled him to employ means and persons both in and out of the Department to attain such ends

as would never have occurred to men not possessing all the qualities of leadership found in him."

Although Hunter's mind was peculiarly fitted to research work and although he had done much excellent work of that character, it is to be doubted that, had he lived, he would ever have returned to personal research, although he often said that he would like to do so. Undoubtedly, however, his great ability in directing and stimulating research would have had full play and the world would have been a great gainer.

It remains only to emphasize Hunter's endowment of qualities that make for warm friendships, not only qualities that bound men to him, but a warmth of heart and a discernment of the finer things in other men that made him more than merely appreciative of them. He was not a demonstrative man; on the contrary, he impressed one as judicial, self-repressed. But as you felt yourself growing closer to him, you were sure of a reciprocal feeling and his life was full of warm friendships of an unexpressed depth. A man is fortunate to have even one friend as true as any one of very many of Hunter's.

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POLICIES RELATING TO TYPE SPECIMENS OF INSECTS.

BY W. L. McATEE.

The institutional view as to policies relative to insect types has been presented,¹ and it would seem only fair to give the individual point of view an inning. Although the writer now works both in cooperation with, and as a member of, institutions maintaining collections of insects, he feels qualified to present the case for the isolated individual worker, if for no other reason than that he is constitutionally an individualist.

The accumulation and due care of types are proper branches of museum business and no objection can be legitimately raised to proper efforts along these lines. Here, as in most lines of endeavor, however, we should beware of setting up a golden calf and worshipping it. Accumulation of types can scarcely be accomplished with dignity, and certainly not to the advantage of science, by the publication of brief or hastily-prepared descriptions of new forms without keys or comparative notes.² Again, accumulation of types by recognition of certain institu-

¹Rehn, J. A. G. Depositories of type material, Ent. News, 32, No. 6, June, 1921, pp. 180-182.

Davis, John J. On the deposition of type material, Ent. News, 32, No. 10, Dec., 1921, p. 315.

Skinner, Henry. Loan of types. Ent. News, 35, No. 1, Jan., 1924, p. 22.

²For supporting view of an ornithologist, see Stone, Witmer, The Auk, 33, No. 1, Jan., 1916, pp. 111-112.

tions as preferred type depositories, despite propaganda for it,¹ is not apt to be a thorough-going success as it is opposed to fundamental desires of human beings, that are just as strong in officials and employees of other museums as in those aiming to be the depositories.² Centralization of types is opposed also to the general museum movement; with the increase in population of cities the number of museums grows, and most of them sooner or later become depositories of types in some branch of natural history. There are certainly more than a hundred different collections in the United States that now contain types of insects, and the number is constantly increasing.

The other horn of the type policies dilemma, namely, care of types, also has its unobjectionable as well as objectionable aspects. Distinctive labelling, good museum care, and separate receptacles (if must be) for types, all can be viewed with equanimity, but when care is so extended in meaning that the loan of type specimens is entirely prohibited, doubts as to the merits of the system naturally arise. Admittedly, this prohibition has brought about in some cases, perhaps partly in all, through praiseworthy motives, but it is just as certain that monopolistic tendencies have had to do with the matter, and refusal to loan types is intended in some cases to forcibly reserve investigations of some group for a certain institution or worker therein. Then, too, resentment toward other institutions or individuals have brought the motive of retaliation into such rulings. Any one who has even a little knowledge of the recent history of type movement or lack of movement in this country can supply from his own experience illustrations of each of the motives mentioned.

The modern tendency in scientific work is towards more highly cooperative effort, but here is a barrier—refusal to loan types—that stands squarely opposed to the growth of cooperation. And from what motives?

A few are noted above and we may refer briefly to others. Fragility. Yes; many insect types are rather fragile, but we have excellent methods of packing, and extensive collections have been moved long distances, and more than once, without the loss of a single specimen. Dr. Walther Horn of the

¹One reason advanced for centralizing types is to make them more accessible to workers. This means, of course, to workers at those museums in particular, certainly not to workers in general. Authorities of would-be depositories, if they believe in the accessibility principle, surely should have bad consciences when they describe and retain the types of large numbers of species from other countries.

²See Rep. Director Mus. Zool. Univ. Mich., 1922, p. 32.

Deutsches Entomologisches Museum¹ writes that in thirty years' shipment of specimens to all parts of the world, only two boxes were smashed. Museums, even of the hoarding type, will loan material of groups they can not work up themselves when it is known to contain undescribed species. In a sense these are more valuable than previously described species, as they are known additions to the collections of the museum. If chances can be taken on the transportation of these specimens to a specialist and back again, during half of which travel they are types, why is it necessary to place an embargo upon them immediately thereafter? In some cases institutions have gone so far as to refuse to return such specimens for reexamination and verification of characters before descriptions had been published. To be candid, however, all this is beside the mark, for fragility is not the factor that has decided certain museums to refuse to loan types; they will not loan types of any kind whether they be alcoholic, slide mounts, birds, mammals, or even petrefactions (fossils) some of which certainly are not fragile and can be transported with as much safety as anything that is entrusted to channels of communication.

We are ingenuously informed that types are deposited in museums with the stipulation that they shall not be loaned, but of what proportion of types is this true? I dare say it is an entirely insignificant percentage, and further venture that the donors making such stipulations if they understood the tangle into which lack of cooperation between museums is driving us, would never have made this requirement, or if still alive would revoke it. Balancing, if not overbalancing this argument, is the fact that individuals who, without due precaution, have deposited types in certain museums and have been unable later to borrow them for their own use, have vowed that no more of their material shall go to such institutions if they can prevent it.

Refusal to loan types has also been defended on the ground that it is unnecessary for other students to see them, and a "distinguished" entomologist has been quoted as follows: "If persons are obliged to see my types to identify species,² my descriptive work must be faulty and not worth while." Surely the distinguished entomologist can not complain if we agree with his statement in its entirety—but we will take the sting away from that remark by noting that the necessity of seeing types *to identify species* may apply to the work of any entomologist. Say another worker collects an important lot of new material, finds useful characters not hitherto used in the

¹This institution, like the national museum in Berlin, and in Vienna, and several other really enlightened institutions, loans types.

²On this theory types should be discarded as unnecessary and not preserved.

group (and this may happen in any group); it is evident that descriptions that do not mention these characters are not a satisfactory basis of identification. This does not indicate that the previous work is intrinsically faulty, and not worth while, but merely that new light has been shed on the problem and a reexamination of material made necessary. It may be stated here that the word type as used in this paper in most cases means holotype. For the purposes of a reviser nothing else will serve to surely identify the species. The species is based on a specimen, and any other specimen may be another species. Neither paratypes nor homotypes have real validity for the critical reviser.

Care of type specimens has assumed so exalted a degree of importance that it has been seriously stated that types "should be preserved intact * * * dismembering * * * should not only be discouraged but prohibited." In the case of some groups of insects where the internal genitalia have become the criterion of specific distinction, following the policy quoted would prevent identification of species described before the genitalic method of classification was in use. In other words, while a museum following such a policy might have numerous types in difficult groups of insects they would be of no value and students would be forced to proceed with their work regardless of the sequestered types. If dissected, described, and illustrated, they would be of value to entomologists the world over, held intact in a museum they are of no more value than a fossil buried in the rock awaiting the stroke of the explorer's pick that shall bring it to the knowledge of men.

No one will deny that types of insect species are of very great value to entomological taxonomy. However, it is evident from the preceding portions of this paper that this value has so impressed certain individuals and institutions that it has impaired their sense of relative values even to the extent of making them blind to the great importance of mutual trust and cooperation among scientists, and scientific institutions, and leading them to do things which render trust and cooperation impossible. While insect types are useful and valuable, often indeed necessary, for the identification of species, they are by no means indispensable to the progress of systematic entomology. There is a wide and very significant gap between the desirability or even importance of identifying described species, and the improvement of the classification of insects. The latter can and will continue regardless of the impossibility of identifying various species, no matter how numerous they may be.

The point may be exemplified by a case I will put in hypothetical form though concrete parallels are not unknown. We will say that the island of Utopia, now with a large and well-educated population, has hitherto depended chiefly upon out-

side agencies for its entomological work. Suppose some particular museum has rather got the run of things from Utopia and some specialist in that museum has published many descriptions (say 500 for a round number) of species in his particular group. The specialist being a mere human, may begin to get chesty about his control of the group and entrenched behind his 500 descriptions may boast "Well, any one that wants to study the Utopiidae has to come here; I've got the group so tied up they can't wiggle."

Never was a more mistaken opinion or a more empty boast. At this stage of Utopian progress some young and ambitious entomologist is due to appear. He becomes interested in the Utopiidae, collects a large number of them, makes observations on their habits and carries on some life-history studies for some time, and making a classification of his own, the young entomologist encounters the problem of utilizing previous work. This, according to the prevailing practice, consists merely of descriptions, without system, most of them not even mentioning characters the student of the group as a whole has found most valuable. To identify many of the previously described species, therefore, he must see types. To his surprise and disgust he finds these are not for loan. Then being a mere human being, like the museum specialist, human attributes begin to manifest themselves. He gets his back up, so to speak, and soliloquizes about as follows: "Why should my work, which I know is much more valuable than those descriptions, be blocked just because I'm not rich enough to make the trip to that museum? It's not fair for those foreigners to monopolize the study of any of our insects, and, by George, I'm going ahead with my work just the same."

And now the present writer interjects, "By the eternals, he is absolutely justified." Moreover, because of its usefulness to the entomological world, his monograph presenting a classification of the group will prevail, it will be used and remembered, while the mere descriptions of his museum rival will be unused and forgotten.

Now let us consider another aspect of our hypothetical case. It is obvious that the young Utopian entomologist will have a lot of type specimens in his possession, possibly more than the museum itself. Many of his species, no doubt, are synonyms, but under the method of specific types the type specimens of all published names are of equal importance. The type of a supposed synonym may be examined by one specialist, and the synonymy stated, but that may not satisfy the next student of the group, so that type also must be available for examination to settle things by the type system.

Is it not clearly apparent from our hypothetical case that the museum has dug a pit for itself? By attempting to monopolize

study of a group, it has brought about a situation that stops its own work, for without completely stultifying itself, it can not proceed without examination of the Utopian types, a thing that will not be made easy, to say the least.

This method, this defense, against museum domination is available to entomologists anywhere and may result, under present conditions in obstructive conflicts about many groups. Is not the lesson plain that it would be much better to adopt more tolerant and cooperative methods? With a hundred or more depositories of insect types in the United States at present and the number certain to grow, a more liberal policy relative to the loaning of types would seem to be necessary. Exceedingly few entomologists can afford either the time or the money to visit a large number of scattered institutions, yet that is just what they must do if taxonomic papers are to be based on types, and other institutions and individuals adopt the same policies as the non-loaning museums. Journeying to consult types is impracticable also for other reasons. In the writer's opinion, the only time an investigator can examine types with real profit is when he is just concluding a revision of a group. Manifestly he can not visit all the type repositories at each revision, so he will have to leave various species in a doubtful status or wholly unidentified. They will have that status henceforth even in their home museum until worked over by a reviser. How much better to send them out and have knowledge of the group made as complete as possible.

SUMMARY.

There are at least two sides to every question, but it is seldom that all points of view receive equal consideration. Those who must strongly favor the centralization of types in a few museums and in prohibiting loans of types usually are employes of those institutions. This in itself shows that these views are prejudiced and it would be well for these advocates to exercise sincere introspection and ask themselves what their views would be if they were attempting to carry on their work across a continent, or half way around the world from the type depository.

Type specimens, like hoarded money, have only potential value. They have actual and practical value only when in use. Under the type system for the recognition of species the question must be faced as to whether types are more valuable than their species. They must be so regarded by those refusing to loan them, for in many, perhaps most, cases species can not be critically identified without examination of their types. Consequently revisers unable to see types either must omit the species concerned or list them merely as unidentified; in other words, such species are on the road to oblivion.

Systematic studies can not be indefinitely postponed, interfered with, or entirely defeated by hoarding of types. No, the tendency will be to get along as well as may be without them. This means that whenever a group is studied from a point of view different from that of the original describer of a species, whenever new characters are discovered and used, a species, the type of which can not be seen, must be ignored. Inevitably some of them will be redescribed; the new species will have a type, and hoarders of types will be just as much inconvenienced by inability to examine that type as its author was by their original action or rather inaction.

All of this points to the desirability of freer loaning of type material. Loans to Tom, Dick, and Harry, to be sure, are not urged, nor to individuals or museums that have shown themselves non-cooperative or unethical, but any responsible and ethical student of a group who has demonstrated his ability to handle taxonomic work satisfactorily should be able to borrow type material for limited periods, when he is at the point in his studies where he can really make profitable use of it.¹ The present tendency is to build insuperable barriers to type loaning among institutions, and such a movement, if not modified, will create rivalries, jealousies, and resentments that in time will prevent all intercourse in types. Is not loaning, at all hazards, preferable to the engendering of such feelings and to the stagnation this system can not fail to cause in research by workers in these museums, bound as they are by the type fetish?

Private collections as a class are more liberal in loaning material than are museums, and it would seem good policy, therefore, pending the liberalization of institutions in this respect, for taxonomists to see that as many types as possible are placed in private collections, and transmitted from one private collection to another. In a comparatively short time, the number of types in private holding will approximate that in institutions, a condition that will put the private collectors in good position to demand more liberal treatment from the museums.

¹In a museum loaning activities could best be handled by a committee. In this way aspects of each case due to personalities both within and without the museum would receive due consideration and the resulting decision in the form of an impersonal ballot would settle each case without intensifying existing differences.

INTERESTING RECORDS OF TWO LITTLE KNOWN PARASITIC HYMENOPTERA.

BY A. B. GAHAN, *U. S. Bureau of Entomology.*

The writer recently received a consignment of material for determination from Guy A. K. Marshall, director of the Imperial Bureau of Entomology, London, England. In the lot were specimens of two species the records for which are very interesting.

***Paracarotomus cephalotes* Ashmead.**

Four male specimens of a parasite reared from puparia of a Syrphid fly, *Paragus* sp., at Ibadan, South Nigeria, by O. B. Lean were especially interesting. Having failed to find anything recorded from the Ethiopian region which agreed with these either specifically or generically, I turned to the North American collection in the desperate hope of finding at least a generic name for them. To my very great surprise they proved to belong to the genus *Paracarotomus* Ashmead and not only were they congeneric with the genotype species, *P. cephalotes* Ashmead, but they were identical in every respect with that species. This genus and species were described (Trans. Amer. Ent. Soc., vol. 21, 1894, p. 335) from a single female specimen taken by A. D. Hopkins at Morgantown, West Virginia, in a sweeping net. In addition to the type the national collection possesses a single male taken by J. R. Malloch at Glen Echo, Maryland, June 18, 1922. Nothing has hitherto been known as to the habits of the species, which is the sole known representative of the genus.

The occurrence of this apparently rare species in two such widely separated and faunistically different regions as North American and Africa at first seemed difficult to believe, but when inquiry of the dipterists developed the fact that at least two species of *Paragus* are common to North America, Europe, and Africa, it did not appear quite so incredible. If the host is capable of such a wide distribution, there appears no good reason why the parasite should not follow it. Perhaps the most remarkable thing after all is that the parasite has not been turned up elsewhere.

***Telenomus nawaii* Ashmead.**

This species was described (Jour. N. Y. Ent., vol. 12, 1904, p. 72) from specimens reared from eggs of an unknown lepidopteron at Gifu, Japan. In the material received from the Imperial Bureau of Entomology, were several specimens which appear to be identical with the types and which were reared from the eggs of *Prodenia litura*, at Levuka, Fiji, by H. W. Simmonds.

NOTES ON THE NESTING HABITS OF *BEMBIX COMATA*
PARKER.By J. B. PARKER, *Catholic University, Washington, D. C.*

These observations on the habits and nesting activities of *Bembix comata* Prkr. were made on the sand dunes of San Francisco within the month of July, 1925. These sand dunes lie adjacent to the ocean shore line and are continually swept by the chilly winds coming in from the Pacific. Although these winds during July are less violent than at other seasons of the year, yet at times they blow with sufficient force to move the loose sand and to cover in a very short time any impressions made in it. The nesting site, where I pursued my investigations, is situated on the sloping side of a depression, the slope facing the ocean but protected somewhat from the force of the winds by a high dune lying between it and the shore line, which was distant from it a half mile or more. Lying as it does, practically all the loose sand had been swept off the nesting site leaving the surface relatively firm and smooth, and it was because of this condition of the sand, no doubt, that the wasps nested here in such large numbers. When the sand at the surface is loose it is next to impossible for these wasps to construct their nests, since any excavation a wasp may make is filled up by the loose wind-driven sand as fast as the wasp can dig it out. Wherever I stepped in walking about over this area I broke the surface and loosened the sand, and whenever this occurred over the entrance to a burrow, if the wind was at that time blowing at all violently, the wasp had no end of trouble in gaining entrance to her nest.

The nest consists of a tunnel or burrow, variable in length but generally from eight to ten inches in extent, which terminates in an enlarged brood chamber, usually about four inches below the surface of the sand. In this brood chamber a single young is reared and until this young wasp has completed its larval stage, that is, its period of feeding, the burrow remains a simple tunnel straight or tortuous as the case may be. But as soon as this larva is full-grown the wasp fills up that part of the tunnel immediately in front of the brood chamber and at a short distance from it toward the entrance proceeds to construct a lateral tunnel which also terminates in a brood chamber. In constructing this lateral, the wasp digs forward and either to right or left, forming almost a complete semicircle, so that the brood chamber lies almost opposite the point where the lateral diverged from the main tunnel and, in fact, in some cases it was further back toward the entrance to the nest than the point of divergence from the main tunnel. When a larva has been reared to full growth in this lateral a second

lateral of similar pattern is constructed off the main tunnel opposite the first one. How other brood chambers, if any, are provided in the same nest I did not learn, since no nest opened contained more than three brood chambers, and of these, two invariably contained encased young and the third an egg or a free, feeding larva in some stage of development.

In constructing its nest this species differs from *B. spinolae* Lep., a closely related species whose nesting habits I have studied here in the District, in that the latter does not construct lateral tunnels in order to provide additional brood chambers. In my observations on *spinolae* I failed to find a single case where two brood chambers were constructed from a single tunnel. When *spinolae* needs a new brood chamber she constructs a new nest. The two species agree in always closing the nest when leaving it and closing it from within on entering. They also agree in having the tunnel, at a point about midway of its length, closed by a quantity of sand which divides the open part of the tunnel into an anterior and posterior part and through which the wasp must dig every time she enters or leaves the brood chamber.

Like *spinolae*, *comata* spends the nights within the nest and also such portions of the day as are not suited to her outdoor activities. She may usually be found in the anterior portion of the tunnel, but I have sometimes found her in the brood chamber. In such cases I suspect that the wasp, alarmed by my digging into the nest had fled to the brood chamber in her efforts to escape.

The utter lack of any instinct on the part of the female *Bembix* to defend her nest and young against intruders was shown repeatedly in my opening of the nests of this species. When a nest is opened with the wasp in the anterior part of the tunnel she will dash out and fly away if given the slightest opportunity. If she is prevented from escaping in this way she will turn about and dig through into the brood chamber, and when this part of the tunnel is opened she will again try to escape if she can. If prevented and forced to retreat into the brood chamber, when she finds herself thus cornered, she will begin a frantic digging in which she will kick out of the brood chamber its entire contents including her helpless offspring in her mad efforts to escape. She knows well enough how to use her sting in procuring food for her young, but seems wholly ignorant of how to use it in defending this same offspring when it is threatened with destruction.

The males also dig burrows in which they spend the nights and presumably such portion of the day as are not suited to their roving activities. In watching the females storing their nests with food I frequently observed that when the female entered the nest with her prey a second wasp would immediately

pop out and make off with all haste to be followed out of the nest by the female, which would buzz about for a short time and then reenter the nest. I suspect that these intruders were males that by mistake had taken up their quarters where they were not wanted. At any rate in a number of instances of this kind I caught the remaining wasp as she left the nest and in each case the wasp proved to be a female.

B. comata, like all species of the genus *Bembix* thus far studied, preys upon various species of flies which she paralyzes with her sting and brings to her nest as food for her young. When she has digged her nest and completed a brood chamber she sets forth at once to obtain a fly on which to place her egg. On July 22, on Lone Mountain, a conspicuous landmark in the city of San Francisco, I watched a female begin and complete the construction of her nest. She began digging at 3:25 p. m. and at 4:20 the nest was finished and the wasp flew away in search of a fly. It thus required 55 minutes for this wasp to construct her nest in sand that was much firmer and harder to dig in than that found on the dunes. She returned with a fly at 4:25 and entered the nest. By this time fog was coming in from the ocean and the temperature had dropped to a point where I found myself decidedly uncomfortable though wearing a sweater. Long before the nest was finished all the other wasps, of which dozens had been buzzing about earlier in the afternoon, had disappeared from the scene. Consequently when the wasp entered the nest with her prey she remained within the nest. I waited till 4:45 and then opened the nest. The tunnel, which was almost straight in its course, was nine inches long and the brood chamber was three and one-half inches below the surface. I found the wasp in the anterior portion of the tunnel and in the brood chamber I found the fly with the newly-laid egg resting upon it in the usual fashion. This first fly, which is always used to support the egg, is placed upon its back on the floor of the brood chamber and is firmly fixed in the sand. The long white egg is placed upright on the fly with the base attached to the right side of the thorax and resting in part on the right wing which is extended almost at right angles to the body. All the eggs discovered were attached in this same fashion. This fly which supports the egg is not eaten by the larva, which remains attached to it after hatching and which thus uses the fly as a support from which it reaches out to feed on other flies brought in by the mother wasp after the larva has emerged from the egg. I repeatedly found instances in which a half-grown larva was still attached by its posterior end to the fly that evidently was used only to support the egg since it was still intact and covered up by the remains of other flies that had served as food.

On the afternoon of July 16, while watching the wasps that were busy among the flowers on some plants near the nesting site among the sand dunes, I saw a female seize a large fly (*Eristalis tenax* L.) on a flower and tumble with it to the sand, where, after a fierce struggle the pair came to rest with the wasp uppermost. The rapidity and violence of the respiratory movements of the wasp showed that the struggle had taxed her energy severely. Before I could get near enough to the pair to use my net, the wasp rose with her victim, flew away a short distance and alighted or rather tumbled down on the sand, where the two struggled and rolled about for some time before the wasp succeeded in righting herself with the fly beneath her. Again I approached and again the wasp flew away with her prey with me in pursuit. Fortunately the wasp directed her flight against the wind which together with the weight of the fly so impeded her that I caught her after a short chase. When taken in the net the wasp released the fly, which to my surprise had not been harmed in the least. It has generally been accepted as a fact that these wasps paralyze their prey by stinging it immediately after seizing it, but in this case, although the wasp had had ample time and opportunity to sting the fly, she had failed to do so.

On July 19, the wind swept over the nesting site with more than usual force and the wasps, active in spite of the strong wind, were having more than their share of trouble in entering their nests with flies. As is well known these wasps carry their prey ventral side up firmly clasped beneath them by use of their middle pair of legs. They do not lay aside their prey while opening the nest but retain it in this position and so carry it into the nest. While opening the burrow they stand on the hind legs and dig with the first pair, the second pair being used to hold the prey. Consequently, on this day when the wind was strong and intermittent, whenever a wasp alighted and began to dig open her nest, a strong puff of wind would strike her and send her with her prey rolling over and over on the sand sometimes to a distance of ten or fifteen feet before she could rise and fly back to her nest. All this was very amusing to the observer, but the wasps did not appear to get much enjoyment out of the proceedings. One wasp came in with an unusually large fly and time and again when she tried to enter her nest the wind caught her and sent her with her fly rolling over the sand. It was fully ten minutes from the time she arrived with her victim until she succeeded in entering her nest. When she did succeed in opening the nest the entrance proved too small to permit her to carry in her prey in the usual way, consequently when she entered carrying the fly she had to release her hold and so left the fly with its legs sticking up in the air and its head tightly wedged in the entrance to the nest. I reached over

with a pair of forceps, seized the fly by one leg and pulled it out. It promptly twisted off the leg and flew away. It was unharmed.

Soon after this another wasp arrived with a large fly and after having almost as much difficulty as the first, finally succeeded in opening her nest. When she entered with her prey she had to release her hold upon it and leave it with its head wedged in the entrance to the nest. Before I reached the fly it set up a vigorous kicking, got loose and flew away. The wasp came out, hunted all about for her prey and then reentered the nest. While she was inside at this time I placed at the entrance a half-eaten large fly that I had taken from another nest and when the wasp came to the entrance she seized this wreck of a fly and dragged it into her nest, from which she presently emerged and flew away in the usual fashion.

Later on in the day a third wasp came to her nest with a large fly and after the usual struggle with the wind succeeded in opening her nest. Like the other two she was obliged to leave her victim wedged head-first in the entrance when she attempted to carry it into the nest. This fly quickly got loose and escaped. The wasp came out, hunted all about and not finding the fly reentered the nest from which she emerged shortly and set off in search of another fly. At the end of twenty minutes she was back with a second fly that I believe to be of the same species as the first. On this occasion I crept quite close to the nest and when the wind rolled the wasp and her victim about on the sand I could plainly see that this fly too had been brought to the nest unharmed. In the struggle that followed, each upset by the wind, the wasp was hard put to it to regain her feet and still maintain her hold upon her prey. As far as I was able to judge from her actions in these struggles, the wasp made strenuous and repeated efforts to sting her victim but it seemed that the necessity of holding the fly tightly against her in order to hold it at all, made it impossible for her to flex the abdomen sufficiently to enable her to use her sting. She finally succeeded in entering the nest leaving this fly wedged in the entrance as she had left the first. Realizing that this one also would escape before the wasp would return to the entrance, I threw the net over it flat just as it got loose and thus held the fly at the entrance under the net. The wasp came out and seized the fly, which had crept a short distance away from the entrance, and started to drag it back into the nest. As the wasp began backing up dragging the fly after her, she became entangled in a fold of the net, released her hold and attempted to escape. Both fly and wasp were taken and are placed on the same pin. The fly, which was identified by Mr. Greene, is *Erstalis arbustorum* L.

Now, the question arises: why did not these wasps paralyze these large flies before bringing them to the nest? Flies as large as these, perhaps specimens of the same species, were found in the nests of other wasps. Were these thus found paralyzed before taken into the nest or afterwards? In two cases where the flies were so large that they had to be left sticking in the entrance when the wasp attempted to carry them into the nest, they were removed by me and found to be paralyzed. Do the individuals of this species of wasp differ in their ability to inflict a sting on a large fly or do some of them make a practice of bringing in their victims alive and then paralyze them after they get them inside the nest? Unfortunately, I failed to find a case in which an uninjured fly was left sticking in the entrance and was afterwards seized and dragged into the nest, nor have I any evidence to show that smaller flies are ever taken into the nest in the usual way before being paralyzed. That some of these wasps do attempt to bring into their nest flies that have not been paralyzed is evident but we shall have to await further investigations before we can explain this departure from what has been regarded as the orthodox course for a *Bembix* wasp to pursue in such cases.

Wasps of this species will work under weather conditions that would completely discourage the other species of this genus, *spinolae* and *nubilipennis*, that I have had an opportunity to study. This is, no doubt, due to the fact that *comata* has become adapted to conditions that prevail on the sand dunes. The wind blowing over the dunes is always cold so that early and late in the day the wasps are not active at all, and if the sky is heavily overcast with clouds they remain inactive all day long. I made several trips to this nesting site arriving about 1:30 P. M., only to find the sky heavily overcast and not a wasp on the wing. The energy, however, that is displayed by these wasps in bringing food to their young is shown by the following data obtained on a day when the clouds were high and thin and the sun occasionally broke through. I kept four nests under observation at the same time for a period of almost two hours. Wasp of No. I arrived at her nest with prey as follows: 11:32, 11:44, 11:52, 11:59, 12:22, and 12:27; No. II, 11:44, 12:38, 12:57, and 1:11; No. III, 11:56, 12:04, 12:27, 12:47, 12:55, and 1:11; No. IV, 12:28, 1:05, 1:12, 1:19, and 1:23. From this it will be seen that No. I brought into her nest six flies in a period of 55 minutes; No. II, four flies in an hour and 27 minutes; No. III, six flies in an hour and 15 minutes; and No. IV, five flies in 55 minutes. The time spent by the wasps within the nest on these visits varied from one-half to one and one-half minute, the usual time being about one minute. The rapidity with which a wasp brings in prey when the day is favorable depends largely upon the age of the

larva she is feeding. If the larva is approaching full growth and the flies furnished are small the larva can devour them almost as fast as the mother wasp can bring them in and this is particularly true if the weather for a day or two preceding has been such that the mother was forced to remain idle.

Unhappily I had not the facilities nor the time to attempt to rear the larva of this species from egg to encasement and consequently I have no data showing how long the feeding period lasts or what quantity of food the larva consumes. When the larva is full grown it forms a case, or cocoon, about it composed of grains of sand held together by cement furnished from glands in the mouth. An examination of several of these encased forms, derived from eggs deposited this season, showed that some had already transformed to the pupa stage. I brought a few of these encased forms home with me and on September 28 an adult female emerged from one of them in the laboratory. It is my conviction that at least two (perhaps more) broods per year are produced on the sand dunes.

In opening the nest on the different days I saved a number of the flies not yet mutilated by the larval wasps and brought them back with me. These were kindly identified for me by Dr. Aldrich. A list of them with his notes follows. The numeral opposite the name indicates the number of specimens.

LIST OF DIPTERA FROM NESTS OF BEMBIX COMATA.

- Apatolestes hera* O. S. 2 ♀, 2 ♂. Known heretofore only from the two type females, collected on the streets of San Francisco by the actor, Henry Edwards, prior to 1877, when the species was described.
- Thereva niveipennis* Kröber. 8. Apparently known heretofore only from the single type, now in the National Museum from Alameda, Calif.
- Hydrophorus graciosus* Ald. 1.
- Hydrophorus* sp. 1.
- Toxomerus* sp. 1. Headless.
- Eristalis tenax* L. 1.
- Eristalis latifrons* Lw. 1.
- Hylemyia cilicrura* Rdi. 1.
- Lispa tentaculata* DeG. 15.
- Muscina assimilis* Fall. 2.
- Musca domestica* L. 2.
- Lucilia sericata* Mg. 1.
- Phormia regina* Mg. 1.
- Senotainia trilineata* V. d. W. 1.
- Tachinomyia similis* Will. 1.
- Bonnetia comta* Fall. 1.
- Meigenielloides cinerea* Tns. 1. We had two—the types, from New Mexico and one from Mexico City.
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A NOTE ON THE DISTRIBUTION AND SYNONYMY OF A MYIASIS-PRODUCING FLY.

BY RAYMOND C. SHANNON, *U. S. Bureau of Entomology.**Lucilia argyricephala* Macquart, *Dipteres Exotiques*, Supp. I, p. 326, 1846.*Lucilia pallescens* Shannon, *Ins. Ins. Mens.* XII, 1924.

While visiting Prof. Mario Bezzi (Turin, Italy, July, 1925), the writer showed him specimens of *Lucilia pallescens* Snn., described from Wilmington, North Carolina. Bezzi stated they were con-specific with *Lucilia argyricephala* Macqr., a well known species in parts of Asia and Africa which has been reported as an agent of myiasis.

Additional material is at hand from the United States which shows this species to be widespread although occurring much less commonly than *Lucilia sericata*. The writer has very recently collected two males of this species on the windows of the National Museum. Apparently the species is established in the vicinity of Washington.

DISTRIBUTION IN THE UNITED STATES.

Texas: Dallas, reared December 27, 1913 (Screw-worm Breeding 327, E. W. Laake).

Dallas, June 19, October 26, 1914 (Bishopp 3375, 39170).

Galveston, August 9, 1914 (Bishopp 3514).

Kansas: Parsons, October 10, 1914 (Bishopp 3790).

Mississippi: Christian Pass, June 8, 1914 (J. M. Aldrich).

North Carolina: Wilmington, July 1, 1919 (Max Kisliuk).

District of Columbia: Washington, September 27, 1920 (A. N. Caudell), September 3, 1925 (R. C. Shannon).

The writer has also seen specimens of *Lucilia argyricephala* from Hawaii in the British Museum collection. (Recorded in the Fauna Hawaiiensis, vol. III, p. 84, as *Lucilia* species, Mts. of Honolulu, 1900.)

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SOME ARACHNIDS FROM THE CARLSBAD CAVE OF NEW MEXICO.

By C. R. CROSBY, *Cornell University.*

OPILIONES PALPATORES.

Family PHALANGIIDAE.

Types of the new species described in this paper are to be deposited in the United States National Museum.

Leiobunum townsendii Weed.

Two specimens were received, one (Bishopp No. 11519) from the surface near the entrance to the cavern, April 13, 1924, and the other (11258) presumably from the cave itself. Both are not fully mature. This species was described from Las Cruces, N. M. I have specimens from Anhalt and Braunsfels, Texas, and from Manitou, Colorado. It is a common open-air form in this region and its presence in the cavern is probably accidental.

ARANEIDA.

Family PHOLCIDAE.

Physocyclus enaulus, new species.

Female.—Length, 4 mm. Cephalothorax nearly circular, depressed at the median groove, pale yellowish, marked in the middle with a brownish Y-shaped mark, the anterior arms extending a short distance along the cervical grooves, the surface sparsely clothed with stiff pale brownish hairs. The eyes situated on a brownish area, but the pale color of the back extends forward between the posterior median eyes.

Posterior eyes nearly equal in size, in a recurved line, the median separated by considerably more than the diameter and subcontiguous to the lateral. Anterior eyes in a straight line, nearly equal in size, subcontiguous. Clypeus five times as wide as diameter of anterior median eye, marked with a broad light brownish band extending from the eyes to the margin, widened at base and at tip, narrower in middle part. Sternum, labium and endites pale yellowish. Sternum broader than long, rounded on the sides and behind. Labium much broader than long, sparsely clothed with short stiff dark hairs. Endites long, narrow, convergent, clothed with stronger hairs than labium. Chelicerae light yellowish-brown, white at base, slightly angulate externally, abundantly clothed

with long brown hairs; the inner tooth black, rather long, slender, curved. Legs pale with a dark ring near tip of femora, at base and near tip of tibia; femora gradually enlarged toward base. Palpi pale, last segment reddish brown.

Abdomen higher than long, compressed, rounded above, nearly straight below, dull grayish white, marked above and to a less extent on the sides with small grayish spots forming an indefinite herring-bone pattern on the back and leaving a lanceolate light area above the spinnerets.

The anterior process of the epigynum is rather short and projects straight downward (Fig. 1); when viewed from below and in front it is seen to be deeply and roundly notched with the opposing points slightly converging (Fig. 2). The posterior part of the epigynum is a strongly convex, transverse, plate, dark reddish-brown in color with a pale area at the middle behind; the posterior margin straight except at the ends where it appears to curve forward due to the overlapping of the posterior margin of the genital furrow. The latter is thickened, rounded, strongly protruding and light brown in color.

Type (female).—Carlsbad Cave, N. M. (Bishopp No. 11517). One specimen.

Family AGELENIDAE

Tegenaria antrias, new species.

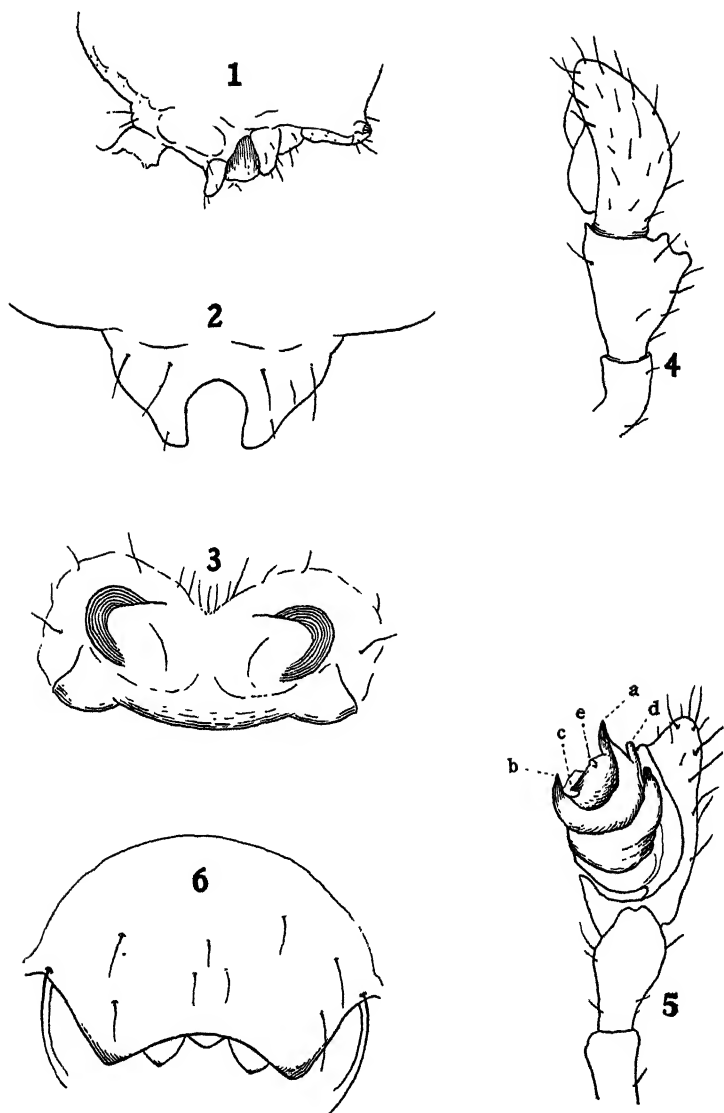
Female.—Length, 7 mm. Cephalothorax pale orange yellow suffused with gray; on the thorax the gray is darkest along the three radiating furrows and on the margin leaving an oval light space surrounding the median groove connected in front with the light area on the top of the head. Sides of the head marked with irregular dark lines coalescent behind and with a fine line running to each posterior eye in front.

Posterior eyes in a slightly procurved line, the median a little smaller than the lateral, separated by a little more than the diameter and slightly farther from the lateral. Anterior eyes subcontiguous, in a slightly procurved line, the median slightly smaller than the lateral. Clypeus twice as wide as diameter of an anterior median eye.

Sternum black on the sides with a yellowish median stripe which is broad in front with a scalloped edge and narrow behind; in the black areas are three yellowish spots on each side, the posterior pair being confluent with the median stripe. Labium, endites and chelicerae light brown. Lower margin of the furrow of the chelicerae armed with 4 small nearly equal teeth evenly spaced. Upper margin of the furrow armed near the tip of the claw with three small teeth, the middle one the largest.

Legs pale orange yellow with grayish annulations, distinct only on the posterior femora. Abdomen above dull gray with a pattern of darker gray chevrons and irregular lines. Ventral side of abdomen same as above marked with dark gray spots and lines. Epigynum (Fig. 3) a transversely quadrangular plate with the posterior margin convex in the middle and gently emarginate each side. The openings are far apart near the anterior angles and in ventral view look like semicircular black grooves.

Type (female).—Carlsbad Caves, N. M. One specimen (Bishopp No. 11518).



CROSBY—ARACHNIDS FROM CARLSBAD CAVE.

Family ARGIOPIDAE.

Subfamily LINYPHINAE.

Group ERIGONEAE.

Dr. S. C. Bishop and I have been studying the group of spiders which have been for the most part placed in the genus *Tmeticus* by Emerton and Banks, and which I (1905) transferred to the genus *Oedothorax*. This is a composite group and will have to be broken up and the species redistributed. One of the species from the Carlsbad Cave falls in one of these new groups. In order that it may be properly placed the following from our forthcoming paper is here published.

"In America there are a number of species which, in the structure of the genital bulb, are closely related to *Erigone*, but which lack the great development of teeth characteristic of that genus. For this group the following new genus is proposed:

PARERIGONE Crosby and Bishop, new genus.

Genotype.—*Erigone probatus* Cambridge.

Abdomen without chitinized sclerites; chelicerae without lateral teeth; no true postocular impressions in the male. The embolic division of the genital bulb consists of an irregular plate without a true tail-piece and which bears the embolus in the form of a minute tubercle. The ventral corner of the plate bears a short simple erect process, not greatly prolonged and denticulate as in *Montilaira* Chamberlin or extremely elongate as in *Catabrithorax* Chamberlin.

Parerigone also includes the following: *Tmeticus contortus* Emerton, *Tmeticus entomologicus* Emerton, *Tmeticus tmeticus index* Emerton, *Tmeticus rectangulatus* Emerton, *Tmeticus trilobatus* Emerton, *Tmeticus simplex* Emerton."

Parerigone antraea, new species.

Male.—Length, 2 mm. Cephalothorax orange yellow, viewed from above rather broad, rounded on the sides, the sides convergent towards the front with a slight constriction at the cervical groove, broadly rounded across the front. Viewed from the side evenly ascending along the back to the posterior eyes with only a very slight depression at the cervical groove and gently arched just back of the eyes. Clypeus straight, somewhat projecting.

Posterior eyes in a straight line, nearly equal in size and equidistant, separated by a little less than the diameter. Anterior eyes in a straight line, the median much smaller than the lateral, close together but well separated from the lateral. Just below the anterior median eyes are two long stiff hairs directed forward and curving upward.

Sternum smooth, sparsely clothed with short stiff hairs. Chelicerae with a prominent tooth on face at the inner angle and with a row of small setiferous

tubercles on the outer margin. Legs and palpi light orange yellow. Abdomen probably gray (not in good condition).

Femur of palpus rather stout, armed below on the lateral side with a row of 5 or 6 spiniferous tubercles. Patella rather thick, curved downward. Ratio of length of femur to that of patella as 20 to 7. Tibia longer than patella, greatly widened distally, the dorso-lateral angle produced into a broad concave process which ends in two rounded teeth separated by a rounded emargination (Fig. 4). Paracymbium rather stout, strongly curved basally with the distal part more nearly straight with a small sharp hook at tip. The embolic division (Fig. 5) is boat-shaped, strongly curved upward in front and behind; the anterior tooth (*a*) recurved, sharp-pointed, the posterior tooth (*b*) stouter and more blunt. Between the two there is a thin longitudinal tooth (*c*) directed backward at the base of which lies a minute tubercle, the embolus. On the mesal side the edge of the embolic sclerite is extended upward as a broad plate which terminates distally in a rounded process (*d*). The median apophysis appears as a broad flattened curved process, the distal edge is turned up into a sharp tooth-like ridge, not shown in figure.

Female.—A little larger than the male. Epigynum (Fig. 6) a broad plate, transversely depressed, the sides convergent posteriorly and with the hind margin broadly and evenly concave with two rounded teeth projecting backward. Between these teeth at a lower level there appears a blunt tooth.

Holotype (male); *allotype* (female).—Carlsbad Cave, N. M. 1 ♂, 2 ♀.

EXPLANATION OF PLATE 1.

Fig. 1. *Physocylus enaulus*. Lateral view of abdomen to show epigynum. Fig. 2. *Physocylus enaulus*. Anterior process of epigynum viewed from in front and below. Fig. 3. *Tegenaria antrias*. Epigynum. Fig. 4. *Parerigone antraea*. Right palpus of male, dorsal view. Fig. 5. *Parerigone antraea*. Right palpus of male, ventral view. *a*, anterior tooth of embolic division; *b*, posterior tooth; *c*, median tooth; *d*, anterior process of lateral projection of embolic division; *e*, opening of ejaculatory duct. Fig. 6. *Parerigone antraea*. Epigynum.

LOCATION OF INDIVIDUAL HOSTS VERSUS SYSTEMATIC RELATION OF HOST SPECIES AS A DETERMINING FACTOR IN PARASITIC ATTACK.

By R. A. CUSHMAN, U. S. Bureau of Entomology.

In going through some old literature recently I happened on the following paragraph:

"Within the last few weeks specimens of a Chalcid were received from a most careful observer and excellent collector, with the statement that they were reared from the eggs of a sawfly deposited in a willow leaf. While I am not in the habit of discrediting any statement which this gentleman makes, the

fact remains that this parasite is plainly from the known habits of its near relatives an enemy of some lepidopterous leaf-miner, and that never under any circumstances could it have been an egg parasite. He had probably put his willow leaf in a pill box and had later found the parasites in the box. He did not examine the leaf carefully for traces of a leaf-miner or he would never have sent in the record."

This quotation reflects the idea formerly prevalent that hymenopterous parasites were closely confined in their host relations to certain groups and were possessed of an unerring instinct that guided them in their search for hosts. The author of the paragraph quoted would probably at present be the first to refute his own argument, for it now appears that, while he was essentially correct in his statement, his correspondent was in all probability entirely correct in his observations. Many parasitic Hymenoptera, especially those whose hosts are concealed within the tissue of their food plants, are in the habit of searching for their hosts in certain sorts of locations, the sort of location being of nearly if not quite as much importance as the systematic position of the host insect. Thus, *Epiurus pterophori* (Ashmead), normally a parasite of lepidopterous larvae living in weed stems, has been reared from the larvae of the sawfly, *Ametastegia glabrata* (Fallen), that had bored into weed stems for pupation. The sawfly larvae were not parasitized because they were a favorite host but because they were in the same sort of location as the favorite host. If they had sought out some other sort of location in which to pupate they would have escaped attack by this parasite.

The chalcid mentioned in the above quotation undoubtedly belongs in the same category, for some years ago I reared several specimens of a species of *Sympiesis* as external parasites of the eggs of the sawfly *Cimbex americana* Leach in willow leaves. There can be no doubt that the species of *Sympiesis* are typically parasitic on leaf-mining lepidoptera. But the habit of parasitizing leaf-miners frequently leads them to attacks insects of other orders living in the same situation. Thus apparently authentic records are published of the rearing of species of this genus from such leaf-mining hosts as *Odontota* and *Orchestes* among the *Coleoptera*, *Agromyza* in *Diptera*, and *Caulicampus* in the *Hymenoptera*. So far as the parasite was concerned in each of these cases the important factor was not the systematic relation of the host but the fact that it was mining in a leaf.

FIVE NEW TERMITES FROM PANAMA AND COSTA RICA.

* BY THOS. E. SNYDER, *U. S. Bureau of Entomology.*

During the summer of 1925, Dr. Harold Kirby, Jr., of Yale University, visited Panama and Costa Rica to collect living termites, for the purpose of studying their intestinal protozoa. Most of his time was spent at the station of the Institute for Research in Tropical America on Barro Colorado Island, Canal Zone, Panama.

In addition to collecting a large series of described termites, five new species were discovered, as well as the hitherto unknown soldier of *Kaloterme*s (*K.*) *tabogae* Snyder, and the hitherto unknown winged adults of *Kaloterme*s (*Calcariterme*s) *emarginicollis* Snyder, and *Armiterme*s (*A.*) *chagresi* Snyder.

This collection by Kirby adds four species to the termite fauna of Panama. At present 42 species of termites, representing 24 genera or subgenera are known from Panama. On Barro Colorado Island in Gatun Lake, the site of the new tropical research station, 28 termites, representing 20 genera or subgenera have been found. It is believed that many more species will be discovered in Panama in regions hitherto unexplored.

Among a large series of two species of the subgenus *Calcariterme*s Snyder were numerous nymphs, on which there appears to be a new subgeneric character, enabling the separation of these nymphs from those in other subgenera of the genus *Kaloterme*s Hagen. This character on nymphs of the soldier caste consists of a medianally divided, raised area posteriorly placed to the markedly emarginate pronotum; this area is light reddish in color and the surface is covered with asperities or surface roughenings, being similar to the ampulae on the dorsal surface of Coleopterous larvae, which serve the purpose of assisting the larvae in crawling through their burrows in wood.

Descriptions of the new species, the hitherto unknown castes and the nymphal character in species of *Calcariterme*s follow herewith.

***Kaloterme*s (*Kaloterme*s) *clevelandi*, new species.**

Soldier.—Head light castaneous-brown, with reddish tinge anteriorly, lighter posteriorly; sides slightly convex; broadest posteriorly, with a depression on slope at epicranial suture; with scattered, long hairs, more numerous anteriorly. Eye spot blackish, suboval, placed on rim of antennal socket. Gula approximately half as wide at middle as where widest (anteriorly). Labrum tongue-shaped, narrowed at apex.

Mandibles black, reddish-brown at base; broad at base, sharp pointed and incurved at apex; left mandible with a sharp pointed marginal tooth at apical third, a molar with sharp anterior point, and another molar near middle; right

mandible with two larger, sharp pointed marginal teeth, one in middle, the other on basal third.

Antenna light yellow-brown with 12-14 segments (usually 12), segments bead-like; third segment castaneous-brown, subclavate and longer than fourth and fifth segments together; fourth segment shorter than second; last segment slender, elongate and subelliptical.

Pronotum light yellow-brown, deeply and roundly concave anteriorly where anterior margin is slightly serrate, anterior corners high, sides nearly straight, but angularly narrowed to posterior margin which is nearly straight except for a slight shallow median emargination; with few scattered long hairs.

Abdomen with tergites light yellow-brown, not hairy, but with a row of hairs near base of each tergite.

Legs with femora markedly swollen.

Measurements.—Length of entire soldier, 8.5 mm.; length of head with mandibles, 3.7 mm.; length of head without mandibles (to anterior), 2.3 mm.; length of left mandible, 1.5 mm.; length of pronotum, 1.2 mm.; length of hind tibia, 1.4 mm.; width of head (where widest posteriorly), 1.45-1.5 mm.; width of pronotum (from anterior to posterior margin), 1.35-1.4 mm.; height of head at middle, 1.4 mm.

*Kaloterme*s (*Kaloterme*s) *clevelandi* differs from *jouteli* Banks in its relatively longer third segment of the antenna, more emarginate and serrate anterior margin of the pronotum (which is similar to that of *marginipennis* Latreille) and its less hairy tergites. The black eye spot (also occurring in *jouteli*) separates *clevelandi* from other *Kaloterme*s of this general region.

Type locality.—Ancon, Canal Zone, Panama.

Described from a series of soldiers collected with nymphs in a dry board of a floor at the type locality by J. Zetek on September 11, 1925. Named in honor of Dr. L. R. Cleveland of Johns Hopkins University in partial recognition of his excellent work on the intestinal protozoa of termites.

Holotype (soldier).—Cat. No. 28728, U. S. National Museum; paratypes in U. S. National Museum and with Kirby at Yale University, New Haven, Connecticut.

*Kaloterme*s (*Kaloterme*s) *tabogae* Snyder.

Soldier.—Head light castaneous-brown with a reddish tinge anteriorly; flat; sides approximately parallel; a depression on slope of epicranial suture; dense short and scattered long hairs. Eye spot hyaline, large, suboval. Gula slender in middle, not half as wide as where widest anteriorly. Labrum yellow-brown; tongue-shaped and straight at apex.

Mandibles black, with reddish tinge at base where broad, incurved and sharp pointed at apex; left mandible with a broad sharp pointed marginal tooth on apical third, a molar with a narrow sharp pointed apical tooth, and another molar slightly beyond middle toward the base; right mandible with two larger sharp pointed but broad marginal teeth, one in middle, the other nearer the base, margin of mandible roughened between first tooth and apex.

Antenna light yellow-brown; 14-15 segments, becoming longer but narrower toward the apex; third segment castaneous, subclavate, longer than fourth and fifth segments together; fourth shorter than second segment; last segment narrow, elongate and subelliptical.

Pronotum yellow, margins darker; not twice as broad as long; deeply roundly emarginate anteriorly where the margin is roughened or finely dentate; anterior corners high; posterior margin shallowly emarginate at middle; sides straight, narrowed posteriorly; with scattered long hairs.

Legs short, femora much swollen.

Abdomen with tergites yellowish, with fairly long hairs at base of each.

Measurements.—Length of entire soldier, 9 mm.; length of head with mandibles, 3.9-4 mm.; length of head without mandibles (to anterior), 2.6 mm.; length of left mandible, 1.6 mm.; length of pronotum (from anterior to posterior margin at sides), 1.6 mm.; length of hind tibia, 1.4 mm.; width of head (where widest posteriorly), 2.2-2.4 mm.; height of head at middle, 1.5 mm.; width of pronotum, 2.15-2.25 mm.

The soldier of *Kaloterme* (*Kaloterme*) *tabogae* is larger than that of *marginipennis* Latreille; the head is not as high in relation to its width (is flatter) and is hairier; the antenna has 2 to 3 more segments; the mandibles are broader and shorter in relation to width of the head, and the marginal teeth are markedly different both in shape and position; the anterior margin of the pronotum is more deeply and angularly concave, the serrations are less marked.

Described from a series of soldiers and nymphs collected by H. Kirby, Jr., on September 11, 1925, at the type locality (Taboga Isld., Panama) in a large colony in dead, dry log on beach near native village.

This species was described in 1924 from the winged adult only. These soldiers are deposited in the U. S. National Museum; additional specimens with Kirby at Yale University.

***Kaloterme* (*Rugiterme*) *kirbyi*, new species.**

Declated female adult.—Head black or very dark brown; smooth; shining; with a few, scattered, long hairs. Post-clypeus white, slightly tinged with yellow; labrum light castaneous, broadly rounded at apex. Eye grayish, large, separated from lower margin of head by a distance less than the diameter of an eye. Ocellus hyaline, raised, projecting, separated from eye by a distance slightly less than the short diameter of an ocellus.

Antenna castaneous, basal segments lighter colored (broken ? beyond tenth segment); segments beadlike, becoming longer and broader toward apex; third segment subclavate, longer than second or fourth segments; fourth segment shorter than second.

Pronotum yellow, contrasting markedly with dark head and wing scales; broader than head; anterior margin concave; sides roundly narrowing to posterior margin which is shallowly concave; with scattered long hairs.

Legs dark brown, except apices of tibiae and tarsi which are yellow.

Abdomen with tergites dark brown, a row of fairly long hairs at base of each; cerci dark colored and fairly long.

Measurements.—Length of entire deälated female adult, 7 mm.; length of head to tip of labrum, 2 mm.; length of pronotum, 1.1 mm.; length of hind tibia, 1.3 mm.; long diameter of eye, 0.402 mm.; width of head at eyes, 1.6 mm.; width of pronotum, 1.8 mm.

*Kaloterme*s (*Rugiterme*s) *kirbyi* has a large eye, a long and broad pronotum, and greater part of legs dark colored. A deälated male found with this typical female and soldier has the pronotum black and a slightly smaller eye, otherwise having the same characters.

Soldier.—Head light yellowish-brown, darker anteriorly; broadest posteriorly; dense long hairs near depressed epicranial suture becoming scarcer posteriorly; front gradually sloping. Eye spot hyaline, large to small, narrow to broad, subelliptical on rim of antennal socket. Gula at middle only one-third as broad as where broadest at front.

Antenna light yellow, basal segments darker; with 12 segments; segments beyond third of about the same size; third segment subclavate, very elongate, nearly as long as the fourth and fifth segments together; fourth shorter than second segment; last segment short, slender and suboval.

Mandibles (Fig. 1) black, except at base where reddish-brown and broad; sharp pointed and incurved at apex; left mandible with one sharp pointed marginal tooth on apical third, in the middle a molar with the anterior point sharp and another blunt molar near the base; right mandible with apical margin roughened or slightly serrate and two large sharp pointed teeth near the base.

Pronotum lighter colored than head, whitish with tinge of yellow; slightly broader than head; anterior margin roundly concave; sides roundly narrowing to posterior margin which is convex except for a shallow median emargination; with scattered long hairs.

Legs with femora swollen.

Abdomen with tergites yellowish, and a row of long hairs on each.

Measurements.—Length of entire soldier, 7.5 mm.; length of head with mandibles, 4.1 mm.; length of head without mandibles (to anterior), 2.6 mm.; length of left mandible, 1.45 mm.; length of pronotum, 0.95 mm.; length of hind tibia, 1.2 mm.; width of head anteriorly, 1.65 mm.; posteriorly, 1.85 mm.; height of head at middle, 1.6 mm.; width of pronotum, 1.95 mm.

The soldier of *Kaloterme*s (*Rugiterme*s) *kirbyi* usually has fewer segments to the antenna than most species of *Rugiterme*s, but this is a variable character, as the segments range all the way from 11 to 15 (12 in holotype).

Type locality.—Cartago, Costa Rica.

Described from 1 deälated, female adult and 1 soldier, collected at the type locality on August 15, 1925, by H. Kirby, Jr., for whom this species is named.

Holotype (soldier).—Cat. No. 28729 U. S. National Museum; morphotype (deälated female adult) and topotypes (soldiers)

in U. S. National Museum; paratypes with Kirby at Yale University.

***Kalotermes (Cryptotermes) breviarticulatus*, new species.**

Winged adult.—Head light yellow-brown (specimens slightly immature?); markings on front of head similar to those in *C. dudleyi* Banks, placed anteriorly to the line defining the epicranial suture and connecting with ocelli; with few, scattered, long hairs. Eye black, not round, projecting, separated from lateral margin of head by a distance less than the long diameter of an eye. Ocelli hyaline, projecting, subelliptical, nearly touching eyes.

Antenna yellow; with 14 segments, becoming longer and broader toward apex; third segment slightly longer than fourth.

Pronotum approximately of the same color as the head; shallowly emarginate anteriorly and posteriorly; sides roundly narrowing toward posterior margin; with scattered long hairs.

Wings hyaline, costal area golden yellow-brown; membrane finely punctate; in fore wing subcosta with 4 long branches to costa; median vein bent up to subcosta at about two-thirds of the length of the wing (near the origin of the third long branch of the subcosta); cubitus a little above middle of wing, branching to apex and sometimes bending up to subcosta near apex.

Legs with pulvillus present between the claws.

Abdomen with tergites light yellow-brown; a row of long hairs at base of each tergite; cerci and styli both present.

Measurements.—Length of entire winged adult, 8.5–8.75 mm.; length of entire deâlated adult, 5.25–5.5 mm.; length of head (to tip of labrum), 1.4 mm.; length of pronotum (not at median), 0.7 mm.; length of fore wing, 6.4 mm.; length of hind tibia, 0.8 mm.; diameter of eye (long diam.), 0.25 mm.; width of head (at eyes), 0.95 mm.; width of pronotum, 0.95 mm.; width of fore wing, 2 mm.

The winged sexual adult of *Kalotermes (Cryptotermes) breviarticulatus* is close to *dudleyi* Banks, but is smaller and has fewer segments to the antenna.

Soldier.—Head castaneous-brown (with a reddish tinge) to piceous at front; in profile slightly concave in middle dorsally; sides convex; longer dorsally than ventrally; surface smooth; front projecting, bulging at middle, surface uneven or roughened; anterior margin of head cleft medianly (but not deeply) by a V-shaped lobe; anterior margin with a slightly elevated rim. Eye spot hyaline, prominent, subelliptical, narrow, at an oblique angle to lateral margin of head. Between antennal socket and mandible is located a piceous, narrow, anteriorly projecting knob, not markedly conical and curving outward-laterally.

Mandibles short, stout, pointed and incurved at apex, gouge-like, not flat; on left mandible, one broad marginal tooth near apex and traces of another near base; on right, one broad marginal tooth near apex, but margin also denticulate near base; marginal teeth not prominent or marked on either mandible.

Antenna tinged with yellow; short; 7 segments; third segment yellow-brown,

subclavate, longer than second or fourth segments; from fourth segment to sixth, segments broader and wedge-shaped; seventh segment slender, subelliptical.

Pronotum yellow, anterior margin yellow-brown with reddish tinge; elevated; jagged or irregular in outline, deeply and angularly emarginate medianly and shallowly emarginate posteriorly; sides roundly narrowing toward posterior margin; with scattered long hairs.

Presternal processes castaneous-brown with reddish tinge; as a broad plate, concave medianly.

Abdomen with tergites tinged with yellow; tergites with short hairs and a row of long hairs at base of each; cerci present.

Measurements.—Length of entire soldier, 4.5 mm.; length of head with mandibles, 1.7 mm.; length of head without mandibles (to anterior margin, dorsally), 1.4 mm.; length of head without mandibles (to anterior margin, ventrally), 1.3 mm.; length of left mandible, 0.4 mm.; length of pronotum (not at median), 0.8 mm.; length of hind tibia, 0.7 mm.; width of head, 1.35–1.40 mm.; height of head (at middle), 1.0 mm.; width of pronotum, 1.3–1.35 mm.

The soldier of *breviarticulatus* is smaller than *dudleyi* Banks and has few segments to the antenna and has the front projecting and not concave.

Type locality.—Taboga Isld., Panama.

Described from five winged adults and two soldiers collected by H. Kirby, Jr., at the type locality on September 11, 1925.

Holotype (soldier).—Cat. No. 28765, U. S. National Museum; morphotype, winged adults; paratypes with Kirby at Yale University.

***Kalotermes* (*Calcaritermes*) *emarginicollis* Snyder.**

Winged adult.—Head dark castaneous-brown, with reddish tinge; smooth; shining; with scattered long hairs. Eye black, not round, projecting, separated from lateral margin of head by a distance less than the long diameter of an eye. Ocellus hyaline, small, projecting suboval, nearly touching eye.

Antenna light yellow-brown; 13 segments, bead-like, becoming longer and broader toward apex; third segment slightly shorter than second but normally, slightly longer than fourth; last segment elongate, slender and subelliptical.

Pronotum of same color as head; anterior margin broadly, roundly concave; posterior margin nearly straight; sides roundly narrowed posteriorly; with long hairs. On the border of the posterior margin of pronotum is a narrow band of raised rugose areas which appear as longitudinal striae; this area is indicated in the nymph of the sexual adult.

Wings dusky brown, costal veins darker; membrane coarsely punctate; in fore wing the median vein is close to and parallel to subcostal vein; cubitus in about middle of wing, with branches to apex of wing and branches and subbranches to lower margin of wing.

Legs with femora dark castaneous-brown; tibiae yellowish, with three dark-colored elongate spines at base; pulvillus present.

Abdomen with tergites dark castaneous-brown, with a row of long hairs in middle and a row of shorter hairs at base of each; cerci not prominent; styli present in males.

Measurements.—Length of entire winged adult, 7.0–7.5 mm.; length of entire dealated adult, 4.6–4.9 mm.; length of head (to tip of labrum), 1.25–1.3 mm.; length of pronotum (anterior to posterior margin), 0.7 mm.; length of fore wing, 5.75 mm.; length of hind tibia, 1 mm.; diameter of eye (long diam.), 0.275 mm.; width of head (at eyes), 1.1 mm.; width of pronotum, 1 mm.; width of fore wing, 1.6 mm.

Nymph of the sexual adult.—Eye spot pink. Wing pads fairly elongate. Meso-notum with asperate or rugose area not as elevated as in nymph of soldier; brownish rather than light reddish in color. Pronotum longer and less emarginate than in nymph of soldier; with a line (which also appears in winged adult) indicating limits of rugose area on posterior border.

Nymph of the soldier.—Eye spot not visible. Meso-notum (Figs. 2, 3) with asperate or rugose area elevated; latter light reddish in color. Asperate area on meso-notum appears in mature soldier. Fore tibiae without spur which occurs in mature soldier.

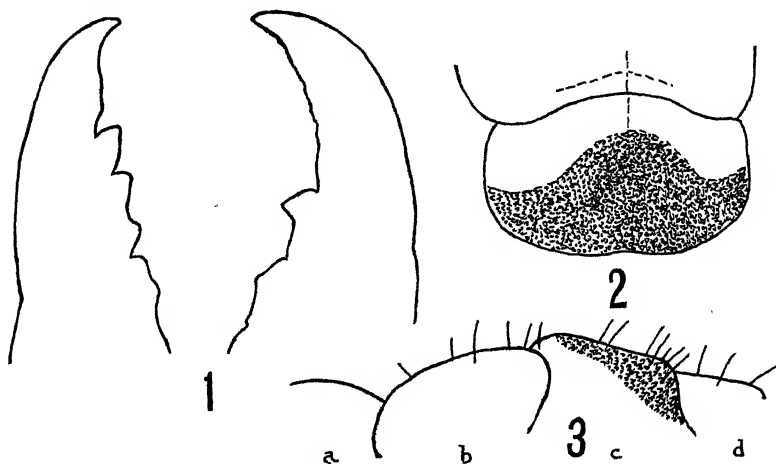


Fig. 1. *Kaloterмес (Rugiterмес) kirbyi* Snyder. Soldier. View of mandibles to show marginal teeth.

Fig. 2. *Kaloterмес (Calcariterмес) emarginicollis* Snyder. Nymph of soldier. Dorsal pigmented asperate ampula on meso-notum.

Fig. 3. *Kaloterмес (Calcariterмес) emarginicollis* Snyder. Nymph of soldier. View of same in profile to show how the area is elevated; (a) head, (b) pronotum, (c) meso-notum, (d) meta-notum.

Described from a series of winged adults collected with soldiers and nymphs at Estrella, Costa Rica, on August 26, 1925, by H. Kirby, Jr. These specimens are deposited in the U. S. National Museum, Kirby having additional material.

This species was described in 1924 from the soldier caste alone. The present specimens are the first winged adults that have been collected.

Armitermes (Armitermes) chagresi Snyder.

Winged adult.—Head light gray-brown, light dots at base of each hair giving a punctate appearance, lighter colored at base of antenna; broadly oval, with dense long hairs. Fontanelle hyaline, large, but smaller than an ocellus, sub-oval, and depressed; area about fontanelle lighter colored.

Eye black, large, projecting, close to lateral margin of head. Ocellus hyaline, large, suboval, projecting, close to eye. Post-clypeus yellow, arched and bilobed. Labrum yellow.

Antenna light yellow-brown; 15 segments, becoming longer toward apex; third segment very slightly longer than second or fourth; last segment slender, elongate and subelliptical.

Pronotum lighter colored than head; emarginate posteriorly; sides roundly narrowed posteriorly; with dense, long hairs.

Wings hyaline, costal area and basal veins darker (yellow to light yellow-brown); membrane with dense, short hairs. In fore wing, median vein closer to cubitus than to subcostal vein and with branches to apex of wing; cubitus slightly below middle of wing, not reaching apex, with approximately 10 branches or subbranches to lower margin of wing.

Legs yellow to light yellow-brown, elongate, slender.

Abdomen with tergites light yellow-brown; tergites with dense, fairly long hairs; cerci not elongate.

Measurements.—Length of entire winged adult, 11.5–11.75 mm.; length of entire deâlated adult, 6.15 mm.; length of head to tip of labrum, 1.35 mm.; length of pronotum (from anterior to posterior margin at sides), 0.6 mm.; length of fore wing, 9.5 mm.; length of hind tibia, 1.7 mm.; diameter of eye (long diam.), 0.45 mm.; width of head (at eyes), 1.2 mm.; width of fore wing, 3.3 mm.; width of pronotum, 1.05 mm.

Described from a series of winged adults collected with soldiers and workers at the type locality (Barro Colorado Isld., C. Z., Panama) by Harold Kirby, Jr., on September 6, 1925.

This species was described in 1924 from the soldier caste alone. These specimens are deposited in the U. S. National Museum; additional specimens with Kirby at Yale University.

Nasutitermes (Subulitermes) kirbyi, new species.

Soldier.—Head yellow; not straight in profile (nagus elevated), but otherwise fairly straight; a slight depression in middle; pear-shaped and slightly constricted back of antennae; a row of four long hairs anteriorly and a row of two hairs posteriorly; also a few scattered very fine microscopic hairs, especially noticeable posteriorly.

Nagus castaneous with a reddish tinge; fairly long; tending towards conical; not very slender; beset with dense short hairs.

Antenna light yellow-brown; 12 segments, becoming longer and broader toward apex; third segment shorter than either second or fourth segments; last segment shorter, slender and subelliptical.

Pronotum tinged with yellow, anterior margin darker; short hairs and a few long hairs on anterior margin.

Abdomen with tergites dirty grey tinged with yellow; tergites with dense short hairs and a row of long hairs at base of each.

Measurements.—Length of entire soldier, 3.1 mm.; head with nasus, 1.35 mm.; head without nasus (to anterior margin), 0.9 mm.; length of nasus, 0.45 mm.; length of pronotum, 0.15 mm.; length of hind tibia, 0.7 mm.; width of head (at broadest portion), 0.7 mm.; width of pronotum, 0.32 mm.

Nasutitermes (Subulitermes) kirbyi has a shorter nasus than *raripilis* Emerson of British Guiana, and the head is not so elevated or convex anteriorly; the head is broader and the nasus darker colored than in *oculatissimus* Emerson of British Guiana; the nasus is not as slender as in *osborni* Emerson of British Guiana.

Type locality.—Barro Colorado Island, C. Z., Panama.

Described from a series of soldiers collected with workers at the type locality by Harold Kirby, Jr., on September 3, 1925, in a small rotten log in the jungle beside the Wheeler trail, a short distance from the station, and associated with a large colony of *Orthognathotermes wheeleri* Snyder. This species is named in honor of Harold Kirby, Jr., of Yale University.

Cotypes, soldiers.—Cat. No. 28730, U. S. National Museum; topotypes with Kirby at Yale University.

***Nasutitermes (Convexitermes) clevelandi*, new species.**

Soldier.—Head yellow; somewhat pear-shaped dorsally; convex in profile; with a slight median depression; slightly constricted back of antennae; with fairly numerous, scattered, long hairs and denser shorter hairs. Nasus deep reddish-brown, conical, thick at the base, covered with dense short hairs.

Antenna light yellow-brown; 11 segments, becoming longer and broader toward apex; second, third, and fourth segments approximately subequal; last segment shorter, slender, subelliptical, slightly pointed at apex.

Pronotum pale, tinged with yellow.

Abdomen with tergites tinged with yellow; tergites with dense fairly long hairs and a longer row of hairs at base of each.

Measurements.—Length of entire soldier, 2.4–2.5 mm.; length of head with nasus, 1.05–1.1 mm.; length of head without nasus to anterior margin, 0.65–0.7 mm.; length of nasus, 0.4 mm.; length of pronotum, 0.1 mm.; length of hind tibia, 0.6 mm.; width of head where widest posteriorly, 0.5–0.55 mm.; width of pronotum, 0.32 mm.;

Nasutitermes (Convexitermes) clevelandi has a less robust nasus than *pallidus* Snyder from Bolivia, the front of the head

at the base of the nasus is less elevated, and the third segment of the antenna is relatively longer.

Type locality.—Barro Colorado Island, C. Z., Panama.

Described from a series of soldiers collected with workers at the type locality on September 5, 1925, by Harold Kirby, Jr. Named in honor of Dr. L. R. Cleveland of The Johns Hopkins University, who has done such excellent work on the intestinal protozoa of termites.

In another colony collected nearby on the same day were nymphs of the sexual winged adults. In these the antenna has 14 segments, the third segment being shorter than the second but longer than the fourth segment; the long diameter of the eye is 0.2 mm.; the length of the hind tibia is 0.75 mm.

Cotypes, soldiers.—Cat. No. 28731, U. S. National Museum; coparatypes with Harold Kirby, Jr., at Yale University.

NEW U. S. LEPIDOPTERA RECORDS WITH NOTES.

BY WM. BARNES AND F. H. BENJAMIN, *Decatur, Illinois*.

Cropia templada Schaus.

Eudipna templada Schaus, Proc. U. S. N. M., vol. 30, 1906, p. 97.

Cropia templada Hampson, Cat. Lep. Phal. B. M., vol. 7, 1908, p. 270, text fig. 42.

Described from Oaxaca, Mexico. The Barnes Collection possesses a single male, Brownsville, Texas (Geo. Dörner), compared by Mr. Schaus with the type and series in the U. S. National Museum.

AZENIA Grote.

Genotype.—*Azenia implora* Grote.

Azenia Grote, Papilio, vol. 2, 1882, p. 186 (*implora* sole species and therefore type).—Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 375 (type designated, *implora*).

Hampson places in this genus one Egyptian, two Australian, and two North American species. The exotic species are probably not strictly congeneric with *implora* and possibly need a new genus erected for them.

A. implora has a large trifid corneous process on the frons. *Edentata*, the other included North American species, is discussed below.

STIRIODES Hampson.

Genotype.—*Metoponia obtusa* Herrich-Schäfer.

Stiriodes Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 245 (type designated,

obtusa. Under *Stiriodes* Hampson places *obtusa* (*obtusula*), *perflava*, *demo*, *procida* and *umbria*).

The difference between this genus and *Azenia* as exemplified by their genotypes is that *Stiriodes* does not possess the three teeth on the corneous process to the frons. Otherwise the two genera are practically identical.

Stiriodes edentata Grote.

Azenia edentata Grote, Can. Ent., vol. 15, 1883, p. 25.—Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 378, text fig. 176.

race **procida** Druce.

Metoponia procida Druce, Biol. Centr.-Amer., Het., vol. 1, 1889, p. 304, pl. 28, fig. 11.

Stiriodes procida Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 248.

form **nepotica** Dyar.

Stiriodes nepotica Dyar, Proc. U. S. N. M., vol. 42, 1912, p. 71.

form **umbria** Druce.

Metoponia umbria Druce, Biol. Centr.-Amer., Het., vol. 2, 1898, p. 491, pl. 94, fig. 28.

Stiriodes umbria Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 248.

The type of *edentata* is in the Museum of the Brooklyn Institute and we possess a compared specimen. The species is correctly identified in collections, but Hampson's figure of the frons is rather exaggerated, showing the frontal process more serrate than it really is. The frons is, in reality, intermediate, but we prefer to place the species in *Stiriodes* where Hampson has placed conspecific forms heretofore known only from Mexico.

Last season, O. C. Poling collected a very long series of *edentata* in the Baboquivari Mts., Ariz., the specimens ranging from the normal yellow *edentata* to more heavily marked, browner and blackish specimens which seemed to agree with Druce's figures of *procida* and *umbria*. A set of specimens was sent to Mr. Schaus, who matched them with the National Museum series of *procida*, *nepotica* and *umbria*.

While all intergrades between *edentata* and the Mexican forms appear to be present in a large proportion of the material from the Baboquivari Mountains, we have not received the darker forms from other Arizona localities. This would seem to indicate that in at least part of its range *edentata* tended to produce only yellow forms, the darker forms being restricted to the region in the vicinity of the Mexican border and southward. For this reason we are listing the oldest of these darker forms as a race and the remainder of those occurring in the United States as forms of this race, although it should be borne in mind that *edentata edentata* comprises about 30% of the

specimens of this species which were sent us by Poling. In other words, *procida*, considered from normal Arizona material is a geographical race, but, considered from Pima County material is only a color form.

***Nocloa alcandra* Druce.**

Xanthia alcandra Druce, Proc. Zool. Soc. Lond., 1890, p. 515; Biol. Centr.-Amer., Lep., Het., vol. 2, 1898, p. 485, pl. 94, fig. 12.

Nocloa alcandra Hampson, Cat. Lep. Phal. B. M., vol. 9, 1910, p. 254, text fig. 103 (type).

A series of specimens were received from the Baboquivari Mts., Pima Co., Ariz., O. C. Poling, dates 1-15 Aug. to 1-15 Sept., 1923, identified by comparison with the Biologia figure and also sent Mr. Schaus as a check for comparison with his Mexican series.

The species is closer to *pilacho* than to *cordova*. From the former it is easily differentiated because of having a distinct oblique dark shade from the costa, between the t. a. line and the orbicular, to the t. p. line at and below vein 2. *N. cordova* has the ground color paler and brighter, is less heavily powdered, and has the medial region above vein 2, except for the ordinary spots, filled with slate color.

***Achaea ablunaris* Guenée.**

Ophisma ablunaris Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 237.

Achaea ablunaris Hampson, Cat. Lep. Phal. B. M., vol. 12, 1913, p. 538, text fig. 125.

Described from Columbia. Hampson is presumably correct in listing *restituta* Walker (Cat. B. M., vol. 14, p. 1366) from St. Domingo and Venezuela, *indistincta* Walker (Cat. B. M., vol. 33, p. 1009) from Bogota and *hilaris* Moeschler (Abh. Senck. Ges., vol. 16, p. 202) from Porto Rico, as synonyms.

A single specimen, identified by Schaus, from Brownsville, Texas, is in the Barnes Collection.

***Ophisma tropicalis* Guenée.**

Ophisma tropicalis Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 238.—

Felder, Felder and Rogenhofer, Reis. Nov., 1874, pl. 116, fig. 14.—Hampson, Cat. Lep. Phal. B. M., vol. 12, 1913, p. 544.

Described from Brazil, Cuba and Columbia. The Barnes collection contains a male from Esper Ranch, Brownsville, Tex. (probably collected by Mr. Jacob Doll) and a female from San Benito, Texas, neither specimen dated. The two specimens are quite different in superficial appearance, color, and intensity of maculation, but the course of the lines is identical

in both. Hampson lists *crocimacula* Guenée (Noct. III, p. 239), *detrahens* Walker (C. B. M., vol. 14, p. 1368), *luteiplaga* Walker (l. c., 1369), *confundens* Walker (l. c., 1372), *stigmatifera* Walker (l. c., 1387), *fugiens* Walker (l. c., 1387) and *morbillosa* Felder, Felder and Rogenhofer (Reis. Nov., pl. 116, fig. 15) in the synonymy. We do not know how many of these names can be saved as forms.

Mr. Schaus is responsible for the identification of our pair as *tropicalis*. He notes, "very variable species."

***Cutina inquieticolor* Dyar.**

Taseopteryx inquieticolor Dyar, Ins. Insc. Menst., vol. 10, 1922, p. 169.

Described from material furnished by Mr. Fred Marloff from Stemper, Hillsboro Co., Florida. The insect is not a *Taseopteryx* (Erastrinae), differing on wing-shape, habitus and tuftings. The mid tibiae are spined, throwing the insect into the Catocalinae where it seems to fit well into the genus *Cutina* Walker (*albopunctella* Walker type and only other known species).

Thanks are due to Mr. Marloff for the donation of one of the types of *inquieticolor*. We have another specimen from Greenville, Mississippi (Geo. Dorner), so that the species will probably be found throughout the Gulf Strip division of the Lower Austral faunal zone.

***Zale sabena* Schaus.**

Homoptera sabena Schaus, Ann. Mag. N. H. (7), vol. 8, 1901, p. 42.

A single specimen is in the Barnes Collection from Palmerlee, Cochise Co., Ariz. This has been compared with the type in the U. S. National Museum by both Schaus and Benjamin.

***Panula(?) scindens* Walker.**

Ophiusa scindens Walker, Cat. Lep. Het. B. M., vol. 15, 1858, p. 1829.

Poaphila ordinans Walker, Cat. Lep. Het. B. M., vol. 15, 1858, p. 1837.

Scindens was described from a single male and *ordinans* from two females, all from St. Domingo (Tweedie).

Twenty-three specimens are in the Barnes Collection from Brownsville and San Benito, Texas, April, May, June and Aug., six of these being labeled "Geo. Dorner."

The identification and synonymy is the work of Mr. Schaus, who also informs us that there is a specimen in the Brooklyn Museum from Brownsville, Texas.

The insect does not fit well into the genus *Panula* (type *inconstans*). While a member of the Erebinæ by the position of vein 5 of the hind wing, in habitus it is closer to *Isogona* (type *natatrix* Guenée) to which we sink *Parora* (type *texana*

Smith); and appears to be in reality a member of that intermediate group between the Erebinæ and the Deltoids which Smith termed Pseudodeltoids.

***Euclystis sytis* Guenée.**

Focilla sytis Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 333.

Described from Brazil. A specimen is in the Barnes Collection from Corpus Christi, Texas, identified by Mr. Schaus.

The genotype of *Euclystis* is *centurialis*.

***Euclystis guerini* Guenée.**

Focilla guerini Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 334.—
Boisduval and Guenée, Spec. Gen., Atlas, vol. 5-7, 1858, pl. 23, fig. 12.

Described from two males, "Campèche," collections "Guérin-Menneville and M. N." The Boisduval and Guenée figure is apparently not taken from one of the types, being that of a female.

A single specimen, Brownsville, Texas, March 11 (Geo. Dorner), is in the Barnes Collection, having been identified by Mr. Schaus.

***Lois lorina* Druce.**

Polia lorina Druce, Proc. Zool. Soc. Lond., 1890, p. 515.

Catocala juanita Schaus, Trans. Am. Ent. Soc., vol. 21, 1894, p. 241.

One specimen labeled "K. W. Fla." is in the Barnes Collection, probably from a dealer, and may be a tropical specimen wrongly labeled. The name should not be added to our lists, but the "record" is published for what it may be worth, and the species should be looked for in Southern Florida.

For the purpose of those who persist in adding species to U. S. lists on the strength of dealers' material we might well add that we possess many which we believe to be wrongly labeled and quote as an example that there are two males of a *Hypolimnas* in the Barnes Collection labeled "Sulphur Springs, Fla., Geo. Franck" which appear to be an African species and not the same as the Formosa species heretofore distributed by dealers as *H. missippus* from Florida.

The identification of *lorina* and its synonymy is the work of Mr. William Schaus.

***Bendis(?) fufius* Schaus.**

Bendis fufius Schaus, Trans. Am. Ent. Soc., vol. 21, 1894, p. 243.

Described from Coatepec, Mexico. Five males and three females are in the Barnes Collection from Brownsville, Texas,

March, April, November, all but two being labeled "Geo. Dörner."

Mr. Schaus has seen specimens of both sexes and compared them with the U. S. National Museum Collection and types. Our males are much more contrastingly black marked than our females, similar in this respect to *detrahens* and *griseipennis*.

***Ephyrodes cacata* Guenée.**

Ephyrodes cacata Guenée, Spec. Gén. Lép., vol. 7 (Noct., III), 1852, p. 366—
Boisduval & Guenée, Spec. Gén., Atlas, vol. 5-7, 1858, pl. 24, fig. 7.

Described from Cuba and Colombia. A single specimen is in the Barnes Collection from Bastrop Co., Texas (O. Meske), identified by Schaus, who notes that it is an extremely variable species.

***Isogona natatrix* Guenée.**

Isogona natatrix Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 323.
Isogona continua Guenée, Spec. Gén., Lép., vol. 7 (Noct., III), 1852, p. 323.

I. natatrix Guenée was described from "Am. Sept.," and *continua* from Brazil, the former being a ♂ and the latter a ♀.

Two specimens are in the Barnes Collection from Brownsville, Texas, March 11 (Geo. Dörner). One of these is labeled "Probably *continua* Gn. $\frac{a}{c}$ B. M." in Dr. McDunnough's handwriting. The other specimen was sent, with the questionable determination *continua* on it, to Mr. Schaus, who replied that it was *continua*, but that both names *natarix* and *continua* referred to a single species.

The species was unknown to Smith (Bull. U. S. N. M., vol. 44, 1893, p. 365), and as far as we are aware, aside from the type of *natarix*, this is the first unquestionably authentic U. S. record. Holland's figure of "*natarix*" (Moth Book, pl. 37, fig. 18) is referable to *tenuis* Grote.

***Gloveria arizonensis* Packard.**

Gloveria dentata Hy. Edwards, Pap., vol. 4, 1884, p. 107.—Barnes & McDunnough, Contr. N. H. Lep. N. A., vol. 1 (2), 1911, p. 17, ignot.

Dr. Dyar informed Barnes & McDunnough that *dentata* was a synonym of *arizonensis* but the name was not placed by them in their Revision (1911).

G. dentata was described from a single ♀ (W. Schaus), collection Neumoegen. This type is in the Neumoegen Collection and appears to be a straight synonym of *arizonensis*, having been matched by Benjamin with an Arizona specimen.

A NEW MELANASTUS FROM TEXAS (COLEOPTERA:
ELATERIDAE).

BY FRANK E. BLAISDELL, Sr., *San Francisco, California.*

Melanastus texanus, new species.

Form oblong-oval, parallel, about two and a half times as long as wide and quite strongly convex. Color black; under surface of body piceous; antennae, mouth-parts and legs, rufo-piceous, palpi rufo-testaceous. Luster dull, slightly shining. Dorsal surface throughout extremely finely microscopically sculptured (granulato-reticulate). Pubescence inconspicuous, pale in color, exceedingly fine and short, very sparse, scarcely projecting beyond the punctures; about twice as long on the tibiae as on the dorsum. Three or four long flying hairs arising from punctures along lateral margins of the mentum anteriorly.

Head slightly transverse, a little wider than one-half of the width of the pronotum; sides of the front scarcely as prominent as the eyes, evenly and rather strongly arcuate to the feebly defined oblique sutures where the margin is slightly notched, epistomal apex arcuate to arcuato-truncate, margin narrowly deflexed behind the labrum, frontal suture obsolete; front scarcely feebly convex, vertex moderately convex, surface densely punctate, punctures small, well defined, narrowly separated, tending to run in lines converging toward the central area behind the epistoma, the latter more densely punctured apically; a feeble carina is present above the eyes, the latter small, flat and partially divided by the obtuse sides of the front, feebly emarginate posteriorly but more strongly so anteriorly, the upper portion is a little larger than the lower, facets small. Canthi not more prominent than the corneal surface of the eye. Antennae extending to almost basal third of the pronotum, joints two to eight inclusive subcylindrical, last three slightly compressed and slightly wider forming a club, eighth joint as long as wide and subequal in size to the sixth or seventh, third twice as long as wide. Mentum slightly triangularly emarginate at apex, lateral lobes evenly rounded; medial angle of the genae subacute and slightly prominent when the mentum is flexed, or in close contact with it when extended. Mandibles bifid, upper lobe twice as large as the lower.

Pronotum a little more than twice as wide as long, marginal bead entire throughout, except at middle of apex, the latter broadly and arcuately emarginate; apical angles obtusely rounded and not prominent anteriorly; sides evenly and moderately arcuate, converging a little anteriorly, feebly and rather broadly sinuate before the basal angles; base broadly and not strongly arcuate, slightly wider than the apex and a little more widely beaded, angles obtuse and distinct; disk evenly convex, densely punctate, punctures well defined, rather small and slightly irregular, usually separated by a distance equal to about their own diameter, slightly larger laterally, not coalescent although tending to run in longitudinal lines.

Prosternum coarsely punctate, punctures discrete; propleurae coarsely and sparsely punctate but not strongly longitudinally rugulose.

Elytra about a third longer than wide, sides parallel to slightly arcuate; apex obtusely rounded, humeri feebly obtuse and very narrowly rounded, very slightly more prominent than the pronotal angles; base transverse; disk quite

evenly and strongly convex, evenly punctate, striae of punctures quite evident, striae punctures equal to those of the pronotum, interstitial series slightly irregular and smaller in the central area, smallest basally, while laterally and apically they are about the same size as the striae punctures, somewhat confused laterally and apically, separated by a distance equal to four or five times their own diameter, intervals flat. Epipleurae finely and very sparsely punctate. Scutellum small, slightly transverse and impunctate apically. Wings vestigial.

Sterna coarsely punctate. Meso-episternum with large circular and apparently entire punctures, epimera with few small punctures; meta-episternum sparsely punctate, punctures latero-apically smaller than on the meta-sternum, the latter with a pre-coxal line of punctures.

Abdomen smooth and shining, rather evenly punctured, punctures slightly larger laterally and a little denser on the fourth and fifth segments.

Legs moderate in length, femora finely and sparsely punctate. Tarsi moderate in length and stoutness, the anterior not modified in the sexes.

Male evidently smaller and more parallel; female slightly more elongate with sides more arcuate.

Measurements.—(Types) Length, male, 5 mm.; width, 2 mm.; female, 6 mm.; width, 2.5 mm.

Type locality.—Gillespie County, Texas. Collected by R. E. McDonald, June, 1925. Twelve specimens studied.

Type and paratypes.—Cat. No. 28850, U. S. N. M. Paratypes also in author's collection.

The species is reported as killing cotton and is therefore of economic importance.

According to Casey's table *texanus* is to be placed amongst those species which have the eyes more coarsely faceted, the pronotum finely but evidently margined at the sides, the latter arcuate and subparallel, distinctly sinuate for a short distance before the basal angles; elytral series of punctures not impressed and quite distinct throughout the width. The luster is dull and therefore falls near *crassicornis* Casey of Humboldt County, California.

By direct comparison *texanus* most closely resembles *exiguus* Casey from Colorado. In the latter the elytral punctures are smaller and more confused, the basal angles of the pronotum are rectangular to slightly acute and the terminal joint of the maxillary palpi appears to be a little more elongate and less broad at apex. A single specimen of *exiguus* Casey is at hand and collected in Colorado.

In *texanus* the elytral series of punctures, both striae and interstitial are quite distinct when viewed longitudinally, the terminal joint of the palpi is more broadly truncate at apex and less elongate and the basal angles of the pronotum are obtuse.

**COCCOPHAGUS LECANII (FITCH) ERRONEOUSLY RECORDED
FROM JAPAN (HYMENOPTERA).**

By A. B. GAHAN, U. S. Bureau of Entomology.

In January, 1919, a series of scale parasites were received by the Bureau of Entomology from Shonosuke Nakayama of the Imperial Plant Quarantine Service, Yokohama, Japan, which the writer identified as *Coccophagus lecanii* (Fitch). These specimens had been reared by K. Yoshida and S. Takahashi from *Ceroplastes rubens* Maskell at Yokohama, and from *Pulvinaria citricola* Kuwana and *Phenacoccus pergandei* Cockerell at Yokohama and Shidzuokaken, Japan.

A reexamination of these specimens has shown that my identification of this parasite was incorrect. Although closely resembling *C. lecanii*, the species is rather easily distinguished by the color of the legs. In *lecanii* the coxae are all black, the trochanters pallid, the femora black with their apices narrowly whitish, the tibiae mostly pale but sometimes more or less infuscated basally, and the tarsi pale with the apical joint dark. In the Japanese species the front coxae are blackish, the middle and hind coxae mostly white (sometimes slightly fuscous and occasionally mostly blackish), the front trochanters and femora usually fuscous, the middle and hind trochanters and basal one-third to one-half of their femora pallid, the apical half or two-thirds of middle and hind femora black or blackish, all tibiae and tarsi pallid with the bases of tibiae and apical joint of tarsi more or less fuscous. Otherwise the two forms seem to agree. The Japanese specimens agree in every essential with the description of *Coccophagus japonicus* Compere (Bulletin Southern California Academy of Sciences, vol. XXIII, 1924, p. 122) and are without doubt that species.

This misidentification is deeply regretted, the more so because it has apparently become the basis for at least three subsequent references in the literature. The record of *Coccophagus lecanii* from Japan by S. Nakayama (Phil. Jour. of Science, vol. 18, 1921, p. 98), and the repetition of this record by Gahan (Proc. U. S. Nat. Mus., vol. 65, 1924, p. 12) are certainly based directly upon this misidentification and it is almost equally certain that T. Ishii [Bul. 3, Dept. Agri. and Com. Imp. Plant Quar. Service (Japan), 1923, p. 86] was dealing with *C. japonicus* instead of *C. lecanii* in his excellent account of the biology and habits of the parasites of *Ceroplastes rubens*.

So far as now known *Coccophagus lecanii* (Fitch) does not occur in Japan.

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ADDRESS OF THE RETIRING PRESIDENT.

BY R. A. CUSHMAN.

In this heyday of the moving picture the subject that I have selected for my address might well be illustrated by that means. Unfortunately the exigencies of time and other conditions have prevented this, and I present for your approval, and I hope for your pleasure, the next related thing, a scenario illustrated by a few stills and closeups.

PARASITISM:—A SCENARIO IN THREE PARTS.

CAST OF CHARACTERS.—A galaxy of villains, no hero nor heroine, but many victims.

VILLAINS.— <i>Iseropus</i>	}	All females and each far more deadly than the male of her species.
<i>Hyposoter</i>		
<i>Polysphincta</i>		
<i>Paniscus</i>		

VICTIMS.—*Hemerocampa*—a cocoon-spinning caterpillar.

Anisota—a family group of very young caterpillars.

Agrotis—a cutworm—full-grown.

Theridium—a spider.

DIRECTOR.—*Mother Nature*.

ASSISTANT DIRECTOR.—*Instinct*.

Scene.—A sunny glade at the edge of a forest. Against the background of the forest stand smaller trees and bushes. In the foreground low herbage and tall weeds.

Part 1.

Time.—*Midafternoon until dusk of a summer day.*

In a forked twig of an elm tree *Hemerocampa*, with most of the hair removed from her body, has just finished the construction of her cocoon and settled herself to a long rest.

On a low hanging leaf of one of the oak trees, the *Anisotas*, tiny brown creatures covered with black tubercles, and with two long black horns extending forward over the head, are feeding happily.

In her web beneath a dead weed top the small, fat *Theridium* is poised waiting for an unwary gnat to blunder into its meshes.

Under the edge of a fallen bit of bark the smooth gray cutworm, *Agrotis*, can be seen taking his afternoon nap.

Into this peaceful scene there fly three slender creatures, two black and one red and dark brown. Each has six legs, two pairs of thin transparent wings, a pair of long, slender, jointed feelers protruding from the head, and at the opposite end a slender, poisoned stiletto, concealed in a sheath. The black one with the elongate oval abdomen and two flattened tubercles on each segment is *Iseropus*. The other black one with slender pedicelled, somewhat club-shaped abdomen, is *Hyposoter*. The small one with black head and red and brown body is *Polysphincta*.

Iseropus flies directly to the elm tree, hovers up and down and around the tree, and finally alights near *Hemerocampa's* cocoon. With her feelers extended in front and tapping against the bark she moves this way and that until finally she touches the cocoon. Eagerly she tests it all over until, apparently satisfied that it suits her purpose, she takes a firm hold with her feet, arches her abdomen until the stiletto points perpendicularly toward the cocoon, then thrusts it through the meshes. The imprisoned *Hemerocampa* feels the prick and wages a desperate but hopeless fight. Stabbed repeatedly she sinks gradually into a coma from which she is destined never to recover. *Iseropus* rests for a few moments while licking up the juices that have followed her weapon from the body of the caterpillar. Again she thrusts it into the cocoon, and soon there drops from near its end an elongate white object. This is shortly followed by another, and another, and yet another until there are a dozen or more. *Iseropus* now withdraws her stiletto, washes her face and feelers, preens her wings and renews her search for victims.

In the meantime *Hyposoter* has been flitting about a small oak tree nearby, and, as our fascinated gaze leaves the *Hemerocampa* cocoon, she alights on the very leaf on which the little *Anisotas* are feeding. Quickly she discovers them with her sensitive feelers. One after another, only a few escaping, she stabs them leaving them inert and helpless, then flies away. Why this wanton destruction? But, is it destruction? Apparently not, for here one and there another of the *Anisotas* shows signs of life. Gradually all recover from their fearful experience and go back to eating as busily as ever. But, have they recovered? We shall see later.

In our absorption in the attack on the *Anisotas* we have forgotten *Polysphincta*. There she is flying from weed-top to weed-top, and now, just as we again catch sight of her, she comes to the one where *Theridium* has her home. In exploring it she touches the web. Eagerly *Theridium* advances to seize her expected prey, but hastily retreats. *Polysphincta* is all alertness. Slowly and cautiously she advances toward the now cowering spider. In desperation *Theridium* lunges for-

ward in an attempt to capture and destroy her enemy, but *Polysphincta* dodges to one side, then again advances. Again and again *Theridium* attacks, each time failing and each time retreating a little farther. Suddenly *Polysphincta* leaps, there is a brief rough and tumble fight ending in the sudden collapse of *Theridium*. *Polysphincta* crawls to the underside of the spider and stabs it repeatedly in the mouth at the same time licking up with avidity a drop of fluid that oozes from the abdomen of her victim. Her appetite satisfied, she changes her position so that her body is across that of the spider, lays the underside of her abdomen along the side of that of the spider and, after holding this position for a time moves away leaving a tiny oval whitish object glued to the spider. Hardly has she left when *Theridium* begins slowly and painfully to recover. Gradually she pulls herself to her feet, slowly recovers her strength and again takes up her position in the web and waits apparently as eagerly as before for the unwary gnat.

The sun has dropped below the horizon and dusk replaces the full light of day. *Agrotis* under the chip of bark stretches himself and, feeling the pangs of hunger, crawls from his retreat to a succulent weed standing close by, and begins his last meal before making a cozy cell in the ground in which to rest and wait for the wings that will carry him hither and yon in cool evenings to come. Suddenly there appears from under a leaf of the plant on which the cutworm is feeding a slender yellowish brown creature flying on broad wings and armed with the same sort of weapon as those of *Iseropus* and the others. This is *Paniscus*. She flies down close to the ground and in her fluttering among the plant stems soon discovers *Agrotis*. Now she alights on the ground and cautiously on tiptoe with her weapon thrust forward she approaches her victim. Sensing danger, *Agrotis* thrashes his head from side to side in a vain endeavor to frighten *Paniscus* away. She tiptoes around him seeking an opening and at last steps quickly in giving him a thrust. He tries to run away but the poison has its deadening effect and he soon lies helpless. Grimly *Paniscus* waits until he is powerless to resist, then she inserts her weapon just back of his head and stands quiet for a time. Now there appears at the base of her stiletto an oval, black, shining object attached by a short stalk to the underside of the stiletto. It slides down to the body of the cutworm. *Paniscus* withdraws her weapon leaving the black object fastened by its stalk to the skin of *Agrotis*. Two more of these she places on her victim, then preens herself for a few moments and flies away among the weed stems. *Agrotis* lies inert for a few moments but finally recovers strength, starts digging into the ground and gradually disappears.

Part 2.

Time.—Beginning a few days later and extending over a period of several weeks.

Hemerocampa still lies motionless in her cocoon; the Anisotas are still feeding voraciously and have grown several times larger; Theridium is still poised in her web with the remains of many gnats entangled in its meshes; and beneath the ground we can see Agrotis ensconced in his earthen bed.

As we glance again at Hemerocampa's cocoon we detect motion in the white objects placed there by Iseropus, and we see coming from each one a tiny white maggot-like creature. These dispose themselves on the body of Hemerocampa and by looking closely we can see that they are biting at the skin with very minute pointed jaws.

Theridium is still carrying the whitish object glued to her back by Polysphincta, and as we look in her direction we see come from it another creature similar to those in the cocoons of Hemerocampa. It begins immediately to gnaw at the skin of Theridium's abdomen. She tries to dislodge it but can not reach it.

Again we look at Agrotis and find that protruding from a slit in the free end of each of the shiny black things placed on his neck by Paniscus is a brown head and part of a white body. Its jaws have already pierced the skin of the cutworm.

Slow motion camera speeds up events so that we see the maggot-like creatures on Hemerocampa, Theridium, and Agrotis, the last two still holding to their egg-shells, increase enormously in size, their victims decreasing correspondingly until all that is left of them is their dried and crumpled skins. We see the slayers crawl away; those of Hemerocampa to spin a bundle of white cocoons inside that of their victims. The devourer of Theridium, hanging to the spider web by patches of minute hooks on its back, builds a beautiful net-work bag about itself, while the cutworm's slayer makes a dense black one.

All this time the Anisotas have been feeding, but most of them have now stopped and lie listlessly on the leaf. They have not grown nearly as large as the few that are still feeding on the edge of a nearby leaf. And now a change comes over them. They seem to be inflated while their necks appear shrivelled. Looking at them closely we see that each encloses a white cocoon, within which is a creature much like those in the cocoon of Hemerocampa. It comes to us that these Anisotas are the ones that we saw so viciously attacked by Hyposoter and that those big healthy ones on the other leaf are the ones who escaped her attention.

*Part 3.**Time.*—A week or ten days later.

Everything is apparently as we last saw it except that there is a hole in one end of each of the cocoons and as we watch there crawls from each not the maggot that we saw make it, but a quite different creature. Each has six legs, two pairs of thin transparent wings, on the head two long slender antennae, and at the opposite end a slender stiletto concealed in a two-parted sheath. From the cocoon of *Hemerocampa* come about a dozen exactly like *Iseropus*, from each of the *Anisotas* one exactly like *Hyposoter*; from the mesh bag in *Theridium*'s web an exact duplicate of *Polysphincta*; and from the ground over the earthen cell of the cutworm the double of *Paniscus*.

We have witnessed the life-cycle of four species of Ichneumon-flies.

By this more or less fanciful and somewhat anachronistic scenario I have attempted to convey to you a picture of the life and habits of a few ichneumon-flies with various habits of attack, oviposition, host relations, and development. It also serves as an admittedly rather long introduction to my real subject:

SOME TYPES OF PARASITISM AMONG THE ICHNEUMONIDAE.

The origin of the parasitic habit in the hymenopterous insects is shrouded in the mists of the dim and distant past. It seems safe to assume that it did not originate on one occasion and one occasion only; the parasitic groups are too diverse to admit of a theory of common origin. It may even be that within a single group, like the Ichneumonidae as we now know it, are lesser groups which have originated at quite different periods and from quite different ancestral forms, and whose present similarity is due to convergence of development resulting from the similarity of the environment and other conditions of the parasitic life rather than from common origin.

Whatever the origin of the various groups of parasitic Hymenoptera we must assume that the carnivorous habit followed the phytophagous habit. We must also, I think, assume that when this change of habit began the Hymenoptera were already a well-defined group distinguishable from the other groups of insects by the same characteristics that distinguish them at the present time. In other words, we must look among the more primitive phytophagous Hymenoptera for clues to the immediate origin of the various groups of parasitic Hymenoptera.

The parasitic habit probably had its origin in the habit practiced by many insects of devouring their fellows. A taste

for such fare was passed on to the progeny of some of these, increasing from generation to generation, until the carnivorous or parasitic habit entirely replaced the phytophagous or plant-eating habit. With the change in method of living and nature of food came certain modifications in form and structure of the larva. Since the egg from which it hatched was placed by the parent in direct contact with the insect that was to furnish it with sustenance the larva had no need for legs with which to move from place to place, no need for strong muscles with which to operate them, and no need for other strong muscles for lengthening and shortening the body in the process of crawling, but muscles only sufficiently strong to permit it to move about in the immediate vicinity of its host and to perform such motions as were necessary in the construction of its cocoon, etc. Its food being soft or fluid and requiring no chewing, it no longer needed strong cutting and grinding jaws, but jaws only strong enough and sharp enough to pierce the skin of its host. No longer needing strong jaws it no longer needed strong muscles to operate them, nor a stiff, strongly arched and heavily braced head capsule to contain and support such muscles.

In living organisms unused or little used structures and organs become lost or atrophied or reduced to size and strength commensurate with their use. The parasitic larva, therefore, lost its legs, acquired small, acutely pointed mandibles and suffered a great reduction in the size and strength of the muscles operating these structures as well as those involved in other movements of the body. Its head lost much of its rigidity and became broad and short. With the loss of strength in the musculature of its body wall its shape was determined by the turgidity furnished by the largely fluid body content. As a natural consequence, instead of being cylindrical and of caterpillar form, it became spindle-shaped, large in the middle and small at each end, more or less curved below, with weakly constricted sutures between the segments of its body.

This, in general, is the form and structure of the full-grown larva of the parasitic hymenopteron.

In the various parasitic groups the larvae have acquired characteristics that differentiate them one group from another.

Within a group further modifications have taken place, so that within, for instance, the family Ichneumonidae are displayed great variations in both form and structure and in habits and manner of living, not only in the adult insects but in all of the preparatory stages. The sometimes very remarkable modifications of the first instar larva and egg are of this later development.

The Ichneumonidae are in very large part parasites of other insects, the comparatively few exceptions to this rule being

parasites of spiders. Some are parasites of larvae and some of pupae, some within the egg-sacs of spiders and some on the spiders themselves.

During its growth the ichneumonid larva passes through several instars, usually five in number; though Timberlake (U. S. Dept. Agr., Bur. Ent. Bull., Tech. Ser. 19, pt. V, 1912) detected only three in *Sesioplex validus* (Cresson) and Tothill (Can. Dept. Agr., Tech. Bull. 3, 1922) a like number in *Hyposoter pilosulus* (Provancher) and *Therion morio* (Fabricius). The present speaker found five in *Thersilochus conotracheli* (Riley) (Journ. Agr. Res., vol. 6, No. 22, 1916), and at least four in *Paniscus* (Proc. Ent. Soc. Wash., vol. 15, 1913, p. 156). Chewyreu (Parasites and Hyperparasites) observed five instars in the last-named genus but only four in *Amblyteles*.

From the standpoint of position of the parasite in relation to the host the Ichneumonidae are divisible into two main groups: external and internal parasites.

The external parasite deposits its eggs on or near the host and the resulting larva feeds on the host from without by puncturing its skin and sucking its juices through the rupture.

Very little is known of the provisions for breathing on the part of the early instars of externally feeding larvae. The only positive observation that I know of is that of Chewyreu, who studied all instars of the larva of *Paniscus* for this point. He says that the first instar has one pair of spiracles on the prothoracic segment, the second instar the prothoracic spiracles and a pair on each of the first six abdominal segments, the third instar another pair on the seventh abdominal segment, and the fourth and fifth instars the full complement of prothoracic and eight pairs of abdominal spiracles.

There is great variation among the external parasites in the habit of stinging preparatory to oviposition and in the effect of the sting on the host. Some species do not sting the host at all, others render it only temporarily comatose, while still others sting it into permanent coma or kill it outright.

The internal parasite deposits its egg within the body of the host and the larva feeds on the host from within. It lies in the body cavity of the host feeding on the fluid and semifluid body content in which it lives. It is fitted for breathing in the aqueous medium in which it finds itself, the spiracle being absent or functionless until such time as the exhaustion of the liquid body content of the host makes direct breathing necessary. In some groups the body of the larva in the early instars has a slender caudal extension of the body wall so modified as to serve as a gill. In other groups no such extension or attenuation occurs and possibly a relatively large part of the necessary oxygen is obtained in the food consumed. Chewyreu found that in *Enicospilus*, of which he knew only the first two and

last instars, the first two have no spiracles and the last the full complement of nine pairs. He says that in *Amblyteles* the first instar has no spiracles, but the second instar has the full nine pairs though these are very small. In the attack by the parent parasite the host is rendered at most temporarily comatose, recovering shortly and continuing its normal activities.

FORMS OF EXTERNAL PARASITISM.

Of external parasitism among the Ichneumonidae there are known to me four types.

In the first and least highly specialized of all the types of parasitism the host is either not stung, is permanently paralyzed or is killed outright by the sting of the parent parasite.

The egg is of simple form, usually elongate oval, more or less curved with tough chorion and without pedicel or other special means of attachment to the host. Such an egg is that of *Calliephialtes* sp. (Fig. 12) and all the eggs of parasites of this group known to me are very similar in form. It is deposited on or near the host.

At the time of the attack by the parent parasite the host is enclosed within the tissue of its food-plant, a cocoon, a pupal shell or other medium, into which or through which the parasite thrusts her ovipositor for stinging the host and for deposition of the egg.

The larva of this type of parasite when first hatched is of the form shown in Fig. 11. The head is relatively large with the mouth on the lower anterior margin and a pair of small simple antennae. The body is composed of thirteen segments besides the head. The full-grown larva (Fig. 16) is fat and maggot-like in form with small head. It has spiracles on each side, the first in the intersegmental skin between the prothorax and mesothorax and one on each of the first eight abdominal segments.

Examples of this type of parasitism are the members of the tribes Rhyssini and Ichneumonini. *Megarhyssa lunator* (Fabricius) according to accounts by Lintner in *The Country Gentleman*, vol. 49, 1884, p. 331, and Riley in *Insect Life*, vol. 1, 1886, p. 171, indicate that the parent parasite does not necessarily sting (perhaps never stings) the host *Tremex* larva, but simply deposits her egg in the *Tremex* burrow, the larva searching out the *Tremex* and killing it. W. S. Fisher tells me that this coincides with his observations on *Megarhyssa* made some years ago in Pennsylvania. The species of the ichneumonine genus *Tromatobia* and many species of the cryptine genus *Gelis* (formerly *Pezomachus*), as well as certain species of the cryptine tribes Hemiteliini and Cryptini, are parasitic within the egg-sacs of spiders, feeding either on the eggs or on the young spiders, which are quite obviously not

severally stung by the parent parasite. *Iseropus coelebs* (Walsh), as probably most of the other members of the tribe Ichneumonini, permanently paralyzes or kills its host preparatory to depositing its eggs. An excellent account of the habits of this species under the name of "*Pimpla inquisitor* Say" is given by Howard in Technical Bulletin 5 of the Bureau of Entomology. The present speaker's paper on "The Calliphialtes Parasite of the Codling Moth" (Journal of Agricultural Research, vol. 1, 1913, pp. 211-237) in an account of another parasite of this type.

Probably few of this type of parasite are, as appears to be the case with *Megarhyssa*, specific enemies of any particular species. The position of the prospective host individual is of nearly or quite as much importance as the systematic position of the host species. Many of the species confine their attack to members of a single insect order, but within that order may have a very wide range of hosts. Thus *Iseropus coelebs* (Walsh), referred to above, parasitizes species of such distantly related lepidopterous genera as *Malacosoma*, *Hemerocampa*, *Notolophus*, *Thyridopteryx*, *Ctenucha*, *Cecropia* and *Olene*, all medium to large Lepidoptera that construct their cocoons in exposed situations. *Epiurus alborictus* (Cresson) is parasitic upon many species of leaf-mining and leaf-folding Lepidoptera. Other species are even less particular as to the nature of their hosts, attacking almost any insect larva that occurs in a suitable place. *Epiurus pterophori* (Ashmead), for example, attacks both lepidopterous and coleopterous borers in weed stems and has also been reared and recorded by Newcomer (Bull. 265, U. S. Dept. Agr.) as a parasite of larvae of the sawfly *Ametastegia glabrata* (Fallen) that had entered the stems of weeds for pupation. Newcomer found that larvae of the sawfly that bored into apples entirely escaped parasitism by this species.

In many, but not all, of the parasites of this group the developmental period is of very short duration, especially that of the larva, there being no apparent synchronizing of the life cycle of the parasite with that of the host. They may thus pass through several generations in a year, using as host whatever suitable species is available.

In a second type of external parasitism the host is only temporarily paralyzed by the sting of the parent parasite, recovering and resuming its customary activities. The egg is fastened to the host by a secretion applied by the parent at the time of oviposition at a point where it is not likely to be knocked off. The larva hatching from this egg, uses the egg-shell as a means of holding on. The host is not protected by any extraneous covering at the time of the oviposition. The only examples of this type of parasitism known to me are the members of the tribe Polysphinctini, which are parasitic upon spiders (Figs. 4, 8, 37).

The very usual host relations of the insects of this group have intrigued the interest of many observers, most of them not especially interested in parasites or even in the Hymenoptera; and short notes concerning one or another of the species have frequently appeared in entomological and other scientific periodicals. This interest is so widespread and the specialization of the insects themselves are so remarkable that a rather extensive treatment of the subject in this place is perhaps permissible.

Probably the first recorded observation on the habits of a *Polysphincta* is that of DeGeer published in 1771 (Memoirs pour servir a l'histoire des Insectes, vol. 2, 1771, pp. 863-6) and his crude figure of the cocoon in the center of the spider web probably the first illustration of any feature of the immature life of one of these insects (Fig. 1). He found a common orb-weaving spider with a parasite larva on its back and reared the parasite through to maturity. Curiously enough none of the European Ichneumonologists has since recognized the species but there can be no doubt that it was a *Polysphinctine*.

Apparently the first to observe the attack of the parasite on the spider was Dillwyn. (Memoranda relating to Coleopterous Insects found in the neighborhood of Swansea, 1829, p. 27.) In a footnote he says: "I have frequently observed a small black species of Ichneumon successively deposit an egg in the abdomen of two or more spiders in the sand-hills near Swansea; and I doubt whether the spider had in any case arrived at its maturity. On one of these occasions I perfectly recollect having seen a young brood of dark-coloured spiders on Crwmllyn Burrows, and that when the Ichneumon hovered over them they appeared alarmed, and instinctively endeavoured to escape." Dillwyn's observation was at fault, for he states that the egg is deposited "in the abdomen." It is interesting, however, to remark that he did note the fact that the spiders had an instinctive fear of the parasite.

Quite naturally the collectors of spiders would be expected to happen upon the immature forms of *Polysphincta* more frequently than the collectors of insects; and so we find one such, John Blackwall, a well known British arachnologist, giving us one of the earliest papers devoted to the subject in his "Account of a Species of Ichneumon whose Larva is parasitic on Spiders" (Ann. and Mag. Nat. Hist., vol. 11, 1843, pp. 1-4). He says "Immature spiders of the species *Epeira antriada* and *Epeira cucurbitina*, and adults of the species *Linyphia minuta* and *Linyphia pusilla* are frequently infested by the larva of a small *Ichneumon*, which feeds upon their juices and ultimately causes their death. This parasite is always attached to the upper part of the abdomen, near its union with the cephalothorax, generally in a transverse but occasionally in a longitudinal direction, and, though it proves a source of constant

irritation, is secured by its position from every attempt of the spider to displace it."

In 1893 McCook (Amer. Spiders, vol. 3, pp. 52-56) writes: "Mr. George Carter Bignell has favored me with an account of the manner in which *Drassus lapidicolens* Walckenaer was attacked by an ichneumon. While walking in the woods he noticed the spider suspended by a silken drop thread from the bough of a large oak. Looking for the cause of such a situation, he found an ichneumon fly walking cautiously down the thread towards its victim. When close to the spider she touched it with her antennae, whereat *Drassus* dropped a few inches lower. The fly, having apparently ascertained that she had found a suitable subject, turned round and walked backwards until close to the spider, where she paused a few moments, and then deposited her egg on its abdomen close to the cephalothorax." Practically the same account is given by Bignell himself (Trans. of the Devons. Assn., vol. 30, 1898, p. 14).

In addition to the references cited above there have been many other records published dealing with these insects. Very few of these have contributed additional facts concerning the general habits of the group, but have merely recorded the association of different species of the group with their spider hosts and their specific habits and development.

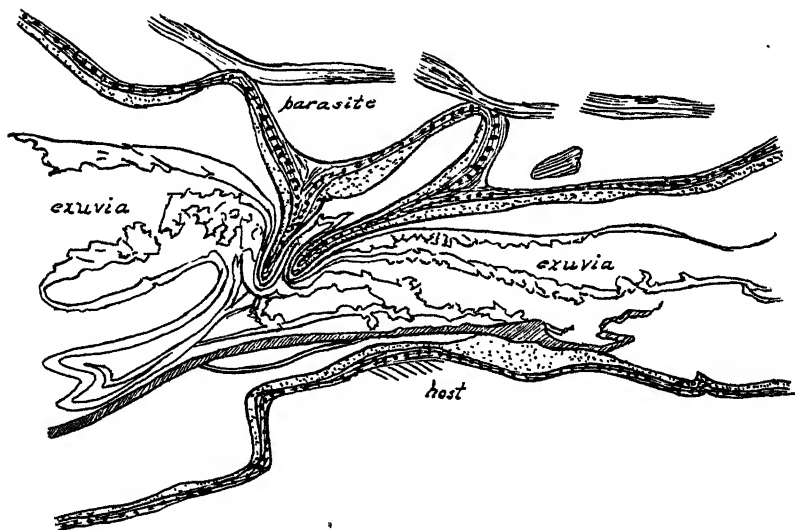
Another arachnologist, E. Nielsen of Copenhagen, produced in 1923 (Saertryk of Entomologiske Meddelelser, 14 Bind., 4-5 Hæfte, pp. 137-205) the most exhaustive and best contribution to the subject of the habits of the *Polysphinctinae* and the modifications in structure associated with their manner of living. Nielsen had the very unusual good fortune of finding in numbers immature stages of several species and made a detailed study of their habits, structure and life history. He observed the oviposition of *Polysphincta eximia* Schmiedeknecht on *Theridium limatum* but not the attack. In oviposition the parasite took up a position with its head opposite the spinnerets of the spider and its ovipositor at the base of the abdomen on the upper side. Nielsen does not describe the egg. In less than an hour the spider had fully recovered from the effect of the sting.

Somewhat more than a year ago I received from a California lady a letter regarding some observations she had made on the habits and life-history of a *Polysphincta*. The subsequent correspondence resulted in her writing for publication a popular account of her observations, which included the complete development from oviposition to eclosion of the adult. Unfortunately this most interesting and delightfully written article has not yet been published and I am unable to quote from it. However, my correspondent sent me living material of both adult parasite, *Polysphincta (Zatypota) parva* (Cresson), and

spider, *Theridium punctipes* Emerton, and I was able on several occasions to observe the act of oviposition. My observations were made on spiders and parasites confined in test tubes. As soon as the spider became aware of the proximity of the parasite it endeavored to catch her, but on discerning the nature of the intruder retreated into its web, whence it made several vain attempts to catch or frighten away its enemy. The parasite advanced and reconnoitered and finally sprang at the spider and delivered her sting so quickly that I was unable to determine where the spider was stung. Almost immediately after the stinging the spider collapsed. The parasite then took up such a position on the under side of the spider that while she stung it repeatedly in the mouth between the chelicerae she was at the same time licking up a drop of fluid that was exuded from the base of the spider's abdomen. It seems most likely that this fluid indicated the location of the first sting. Her appetite satisfied, the parasite changed her position to one across the underside of the spider at its waist and for some time apparently scratched the surface of its abdomen near the base and to one side of the middle with the tip of her ovipositor but did not thrust it through the skin. She then laid her abdomen against that of the spider so that the base of her ovipositor was over the spot where she had been scratching, remained quiescent for a short time and finally crawled away leaving her egg glued to the spot. The egg was about half a millimeter long by about a third as broad and equally rounded at both ends. It was covered with a shellac-like secretion that spread out on the surface of the host a short distance beyond the egg.

Blackwall thought that the parasite larva maintained its position on the spider by means of the mouth and "a viscid secretion emitted from its caudal extremity." This opinion was not refuted until nearly fifty years later, when Borries (Ent. Meddel., vol. 2, pp. 155-161), working with a single preserved parasitized spider discovered that this was accomplished by means of the egg-shell and the larval exuvia (Fig. 3). Nielsen found that the newly hatched larva of *Polysphincta clypeata* Holmgren remains partly enclosed in the egg-shell (Fig. 6). In *Polysphincta eximia* Schmiedeknecht he discovered that each subsequent instar maintains its hold to the exuvium of the last preceding instar by means of two pairs of fleshy projections situated on the ventral surface of the fifth and sixth abdominal segments (Figs. 2, 5) which are telescoped in the corresponding structures in the previous instar. He presents two figures of this mechanism in longitudinal section, of which I reproduce one (text fig.) showing apparently four exuvia beneath the last stage larva. I have been able to corroborate the observations of Borries and Nielsen in the case of *Polysphincta parvae* (Cresson).

In its last instar the polysphinctine larva has on the dorsum paired rounded protuberances bearing minute recurved hooks (Fig. 7 a). The larva spins its cocoon on the spider web and uses these hooks for suspending itself in the web while laying the foundations of the cocoon. Having engaged the hooks on the web the larva retracts the structure within the body, thus retaining a firm hold. The number and arrangement of these dorsal "pseudopods" varies with the species. Nielsen found that there are eight pairs in *Polysphincta eximia* (Fig. 7), *nielsenii*, *tuberosa* (Fig. 36), and *clypeata* (Fig. 38), and seven



Longitudinal section of larva of *Polysphincta eximia* Schmiedeknecht showing attachment to host. (Redrawn from Nielsen.)

pairs in *pallipes*. In all of these the first pair is on the meta-thorax and the others on the first six or seven abdominal segments. In *Polysphincta percontatoria* var. *gracilis*, however, he found only four pairs, placed on the third to sixth abdominal segments.

A third type of external parasitism is in some respects similar to the second type in that the paralysis of the host is only temporary, the host at the time of oviposition is not enclosed in any extraneous covering, and the larva uses the egg-shell as an anchor for maintaining its position on the host, but the egg itself is entirely different, being provided with a pedicel which is thrust through the skin of the host. In the act of oviposition the egg itself is not enclosed in the ovipositor but is fastened to it by the pedicel. Representatives of this type are the Paniscini and probably the true Tryphonini. The habits of the members

of the latter group are very little known except that they are, for the most part at least, parasitic on the larvae of the sawflies, although the habit of certain of them of carrying eggs on their ovipositors is well known to every collector of Ichneumonidae. It is on this habit that the generic names *Polyblastus* and *Monoblastus* of Hartig dating from 1837 are based, *Polyblastus* including originally those species of the old genus *Tryphon* Fallen that carry several to many eggs exposed on the ovipositor and *Monoblastus* those that carry only one egg in this manner. Probably most of them attack the host as a full-grown larva, which later constructs its cocoon. Of *Paniscus*, on the other hand, much has been written and many figures have been published.

Apparently the first to record any biological observations on *Paniscus* was Goedart, who in 1700 (*Metamorphoses Naturelles ou Histoire des Insects*, vol. 2, p. 163) reared five specimens of what was undoubtedly *Paniscus cephalotes* Holmgren from the caterpillar of the puss moth (*Dicramura vinula*). His figure of the bundle of cocoons from which these specimens emerged is probably the earliest published figure concerning the early stages of this genus.

The next published observation was that of Bonnet in 1755. (*Mémoires présentés à l'Académie des Sciences de Paris par divers Sçavans*, vol. 2, pp. 281-282). In a paper on two parasites of the puss-moth, he says (I give a free translation): "The second species is the more remarkable. It lives externally on the caterpillar; it appears at first in the form of a little egg, black and brilliant as jet. This little body seems implanted in the caterpillar by a short pedicel. Little by little there emerges from under this sort of shell a soft whitish worm. The worm becomes larger and longer from day to day, but without abandoning its shell. The shell seems to diminish in size, or rather this diminution is only apparent, being due to the comparison that the eye makes between the size of the shell and the size of the worm. Finally the worm molts; then the shell drops and the worm appears much like those that one finds in fruits or in the bodies of different insects. I have not been able to find out to what class it belongs. I have sometimes seen it spin threads after the manner of caterpillars." In 1771 DeGeer (*Mémoires pour servir à l'histoire des Insectes*, vol. 2, pt. 2, pp. 850-861) gave a remarkably accurate account of the habits and development of probably the same species as that observed by Bonnet. He reared from a cocoon of *Dicranura vinula* nine specimens of *Paniscus*. Upon opening the cocoon he found a mass of parasite cocoons and the dry and shrunken skin of the caterpillar. Remarking: "Cependant cette peau m'a fait voir une chose à quoi je ne m'attendois pas et que mérite l'attention d'un naturaliste," he proceeds to examine this cater-

pillar skin and finds several black shells each strongly attached and implanted in the skin by means of a long, slender pedicel, having near its insertion in the skin two or three thickenings suggesting articulations (Fig. 19). To each was attached a white, wrinkled pellicle which he thought was a single exuvium of the parasite larva (Fig. 23). DeGeer illustrated his observations by suprisingly good figures showing the development and anatomical details of *Paniscus*.

Newport (Trans. Linn. Soc. Lond., vol. 21, 1852, pp. 71-76, Pl. VIII, figs. 13-19) gives an extended account of the habits and biology of *Paniscus virgatus* (Fourcroy) as a parasite of *Mamestra pisi*. His principal contribution to the knowledge of the insects of this group is his discovery that the "white pellicle" of DeGeer is composed of the several exuvia of the larva, each telescoped into the preceding one and the first into the egg-shell (Fig. 9).

Many writers have recorded additional observations on the life and habits of *Paniscus*, but the latest and most detailed is a paper by Chewyreuv, "Parasites and Hyperparasites," published in Russia in 1912. A translation of this was made by Jacob Kotinsky, formerly of the Bureau of Entomology, and it is on this translation that the subsequent discussion of Chewyreuv's work is based.

The egg of *Paniscus* is comparatively large, in some species as much as a millimeter in length, broadly oval, dark brown or black depending on the species, and at the caudal end has on the ventral surface a flexible pedicel (Figs. 19, 20, 24, 28, 29, 30). On the dorsal side near the anterior end there is a small weakly chitinized depression with radiating grooves, the micropyle (Fig. 22). Chewyreuv found that the form and structure of the micropyle differs in different species.

In oviposition only the stalk of the egg is within the channel of the ovipositor, the egg itself lying along the ventral side (Fig. 25). The ovipositor is thrust a short distance into the host, serving to thread the pedicel of the egg through the skin. The twisting up of the pedicel after it leaves the ovipositor serves to hold the egg in place while the ovipositor is withdrawn, and the subsequent healing of the wound in the host fastens it still more securely.

The hatching of the larva in *Paniscus* is peculiar in that it at first only protrudes its head from a slit beginning at the micropyle and extending backward along the ventral surface of the egg. The time of hatching has no very intimate relation to the time of deposition of the egg for in some instances the egg may not hatch for several days after deposition while at other times it is already hatched when deposited as shown in Fig. 25.

Paniscus has the habit of throwing off fully developed eggs for which no host has been found, which action is, at least in

part, to avoid the disastrous results following hatching of the eggs within the body of the mother. Chewyreuvs recorded one instance of the killing of a female in this manner by her own progeny.

The larva retains its hold on the egg-shell and thus to its host until practically full-grown. This is accomplished by means of a patch of minute forwardly directed spines at the apex of the last abdominal segment (Fig. 46).

The larval stage consists of five instars each telescoped within the last preceding exuvium (Figs. 9-21).

In *Paniscus* and very likely in all of the parasites of this type the attack of the parasite is made on nearly or quite full-grown, free-living host larvae, which thereafter burrow into or some other medium for pupation.

The first instar larva of *Paniscus* (Figs. 26, 27) is short and fat with a relatively large and narrow, heavily chitinized head, distinctly constricted at its junction with the body. At each succeeding molt the head becomes relatively smaller and broader and less heavily chitinized. At full-growth (Fig. 13) it is broadest at its junction with the body, much shorter than broad, and hardly more heavily chitinized than the rest of the body. As stated before the first instar has only one pair of spiracles, those on the thorax. These really belong to the mesothorax, but are pushed forward into the intersegmental skin between the prothorax and mesothorax and appear to lie in the prothorax, to which segment Chewyreuvs ascribed them. In the second instar six more pairs appear, one pair on each of the first six abdominal segments. The third instar adds another pair on the seventh segment, and the fourth and fifth instars have each another pair on the eighth segment.

Chewyreuvs gives a very long and detailed account of the attack and oviposition of *Paniscus cristatus* (Thomson) and *Paniscus ocellaris* Thomson. The female parasite first stings the caterpillar, which attempts to escape by running and rolling but finally succumbs to the effect of the poison. When the caterpillar has been rendered helpless the parasite mounts it, inserts the ovipositor a short distance in the intersegmental skin between the thoracic segments or between thorax and abdomen, and there plants her egg (Fig. 39). Eggs that through faulty instinct are deposited elsewhere do not develop because they can be reached and destroyed by the caterpillar.

A fourth type of external parasitism is very similar to the first type discussed in that the egg is deposited externally with relation to the host. But it differs from the first type in that there is a partial return to the phytophagous habit.

The only known example of this type of parasitism is *Grotea anguina* Cresson, a parasite of the bee *Ceratina dupla* Say, and to S. Graenicher (Ent. News, 1905, pp. 44-46) is due the credit of having discovered the very peculiar habits of this species.

Graenicher says that the egg of *Grotea* is usually placed lengthwise on top of the egg of the bee. The larva of the parasite may emerge either earlier or later than the bee larva, but its first food is the contents of the egg or of the larva as the case may be. Thereafter it feeds for several days on the bee bread stored by the parent bee. This exhausted, it forces its way into the next cell in the nest, killing the bee larva. It usually enters a third cell and frequently a fourth, killing the occupant of each. At the end of about two weeks the parasite larva is full-grown and begins the construction of its cocoon. After clearing a space three or four centimeters long of pith, bee bread, etc., it builds a hard partition at each end of the burrow and lines the burrow with a thin layer of silk. In this cocoon it passes the winter emerging as an adult in time to attack the next generation of *Ceratina*. Unfortunately Graenicher describes only the egg of *Grotea* and his article is without illustrations. He says the egg is hardly half as long and a fourth as thick as that of the bee, which he describes as about two and a half mm. long and one mm. thick.

FORMS OF INTERNAL PARASITISM.

You will remember that in our general description of internal parasitism we stated that the egg of the parasite is deposited and the larva feeds within the body of the host, that the body of the larva in its early instars is modified for breathing in an aqueous medium and that the host is not or is only temporarily comatose after the oviposition of the parasite.

Of this general group there are at least five divisions or types among the Ichneumonidae. In the least highly specialized type the host is attacked in a late stage of its development, full-grown larva or pupa, and the development of the parasite is not closely synchronized with that of the host. The entire developmental period is passed within the host, and the parasite makes very little if any cocoon. Pupation takes place in the pupa of the host. To this class belong the members of the tribe Ephialtini and probably those of the tribe Theroniini.

The egg is practically identical in form and structure with that of the first type of external parasite.

These parasites are very catholic in their selection of hosts though normally confined to the Lepidoptera. Within this order, however, they seem to have little choice. *Itoplectis conquisitor* (Say), for example, is known to parasitize a great many species in both macrolepidoptera and microlepidoptera.

The members of the subfamily Joppinae, which includes the large genus *Amblyteles*, appear to represent a somewhat different type of parasitism from that of the Ephialtini in being more highly specialized for the internally parasitic life. As

is well known the adult parasite emerges from the chrysalis of the lepidopterous host. The only detailed observations that I know of on the life and development of a member of this group are those of Chewyreuv. He states that the host is attacked in the last larval instar by *Amblyteles* and *Ichneumon* (old sense), and he gives accounts of the attack by both *Ichneumon sarcitorius* Linné and *Amblyteles vadatorius* Illiger. The egg of each has a very thin, colorless, transparent chorion (Fig. 33). He does not give measurements of the egg, but from the small size of the newly hatched larva (Fig. 32) it is much smaller in relation to the size of the adult insect than is that of *Itoplectis*.

According to Chewyreuv the newly hatched larva of *Amblyteles vadatorius* (Fig. 35) has a relatively large, heavily chitinated yellow head with white body. The body tapers backward from the head and consists of twelve segments, of which the last has a transverse groove so that the body seems to be thirteen-jointed. There are no spiracles. The antennae are represented by hyaline circles on the upper side of the head. In the second instar, which is in general very much like the preceding, the spiracles appear to the full complement of nine pairs. The author does not say whether or not he considers them functional, merely describing them as very small and, according to Kotinsky's translation, "bung-shaped." The third instar, judging from the head shield, which was all that he knew of it, Chewyreuv says is much like the second. The fourth and, according to the author, the last instar (Fig. 31), judging by his figures is of somewhat different form with relatively smaller head and much larger spiracles.

In a third type of internal parasitism the specialization for the internally parasitic habit has gone much farther, especially in the early larval instars. Oviposition of the parasite takes place when the host is in the larval stage, frequently very young, the development of the parasite proceeds along with that of the host, the adult of the parasite emerges from a later instar of the host larva or from the host pupa. The development of the parasite is frequently so closely synchronized with that of the host that the parasite matures at the time when the host is in the proper stage of development for parasitization. Examples of this type of parasitism are to be found in the Ophionine tribes, Campoplegini and Porizonini, probably also in other tribes of this subfamily, certain Tryphoninae, and possible in the Ichneumonine tribes Lissonotini and Glyptini.

The egg is relatively small, elongately oval and more or less curved (Fig. 10).

The first instar larva is frequently very slender and has the area of the body surface further relatively increased by an extension of the last abdominal segment into a longer or shorter

tail-like appendage. The head is relatively very large and heavily chitinized, narrowly attached to the body and with the mouth on the anterior ventral surface (Figs. 17, 45, 47). Spiracles are absent. During this instar the larva increases very greatly in size with the head and sometimes the tail retaining their original size (Fig. 15). With its first molt the larva of *Thersilochus* was found by Cushman to entirely change its appearance, the head becoming broader and shorter, the mouth parts very weak, and the tail disappearing entirely (Fig. 14). The third instar larva is very similar to the second, differing practically only in size. The fourth and fifth instars (Fig. 18) are of the typical ichneumonid form, the last leaving the body of the host and spinning its cocoon in the underground cell made by the host larva.

Timberlake (Bur. Ent., Tech. Ser. Bull. 19, part V, 1912), in a study of (*Limnerium*) *Sesioplex validus* (Cresson), and Tothill (Dept. Agr. Canada Tech. Ser. Bull. 3, 1922), working with (*Campoplex*) *Hyposoter pilosulus* (Provancher), each distinguished only three larval instars. Both found the second instar to be quite similar to the first but with shorter tail (Fig. 43). Tothill states that the spiracles first appear in the third instar. Timberlake thought the caudal appendage in the first two instars to be a blood gill, but Tothill showed that the dorsal blood vessel does not enter the appendage, but that instead it is a tracheal gill, being completely filled with tracheids which are connected directly with the tracheal system (Figs. 48, 49), and each at its distal end penetrating the basement membrane of the body wall into an air chamber formed of a single very large hypodermal cell. These disappear in the third instar, when the spiracles become functional (Fig. 50).

A fourth type of internal parasitism, exemplified by *Therion morio* (Fabricius) differs from the last type discussed in that the egg, instead of being simply deposited loosely in the body cavity of the host is fastened to the inside of its body wall by a tabor cushion on one side of the egg, which differs further from that of the simpler type of internal parasites by being greatly prolonged at the caudal end (Fig. 42). Tothill thought the attachment pad to represent the micropyle, on what basis he does not state.

This type of parasitism differs from the simpler type also in that the first instar larva is enclosed within a membraneous sac (Fig. 41) which Tothill considered to be the embryonic membrane, and he therefore terms this instar "the feeding embryo." This sac also is fixed to the inside of the body wall of the host. The function of breathing is accomplished in the same manner as in *Hyposoter* (Fig. 44). The larva remains in the first instar until long after the host has pupated.

In the second instar the larva leaves the sac and thenceforth lives free in the fluid body content of the host. From this time on this type of parasitism does not differ essentially from the last type discussed. Tothill found three larval instars in *Therion*.

Of the last type of internal parasitism that I shall discuss there is so far as is at present known only one instance, *Diplazon laetatorius* (Fabricius), although it is probable that the habits throughout the tribe Diplazonini are the same. This knowledge concerning the parasitic life of *laetatorius* is very meagre. It has long been known that this species, as well as many others of the same tribe, are internal parasites of the dipterous family Syrphidae, emerging from the puparium. But in 1914 Kelly (Journ. Econ. Ent., vol. 7, pp. 294-297) brought out the fact that the parasite deposits her egg in the egg of the host, thus passing in its development through three of the stages of its host.

It is quite probable that there will be found among the Ichneumonidae other types of parasitism differing in some important particular from any of those that I have discussed; but I have summarized all those types of which I have first-hand knowledge or which I have been able to find discussed in literature. It is evident from the paucity of the published accounts of this phase of Ichneumonology that much remains to be done and should be done.

I have purposely refrained from any detailed discussion of the comparative morphology of the larvae in the various types of parasitism and also of the modifications in the adult insects associated with the different parasitic habits, partly because its inclusion in this address would have resulted in too great length and partly because such information as is available is too fragmentary and in considerable part too inaccurate to be used as a basis for conclusions.

But from what little study I have made of the immature stages of insects of this group it is evident that there is here available much of value in the determination of relationships within the group.

EXPLANATION OF PLATE 2.

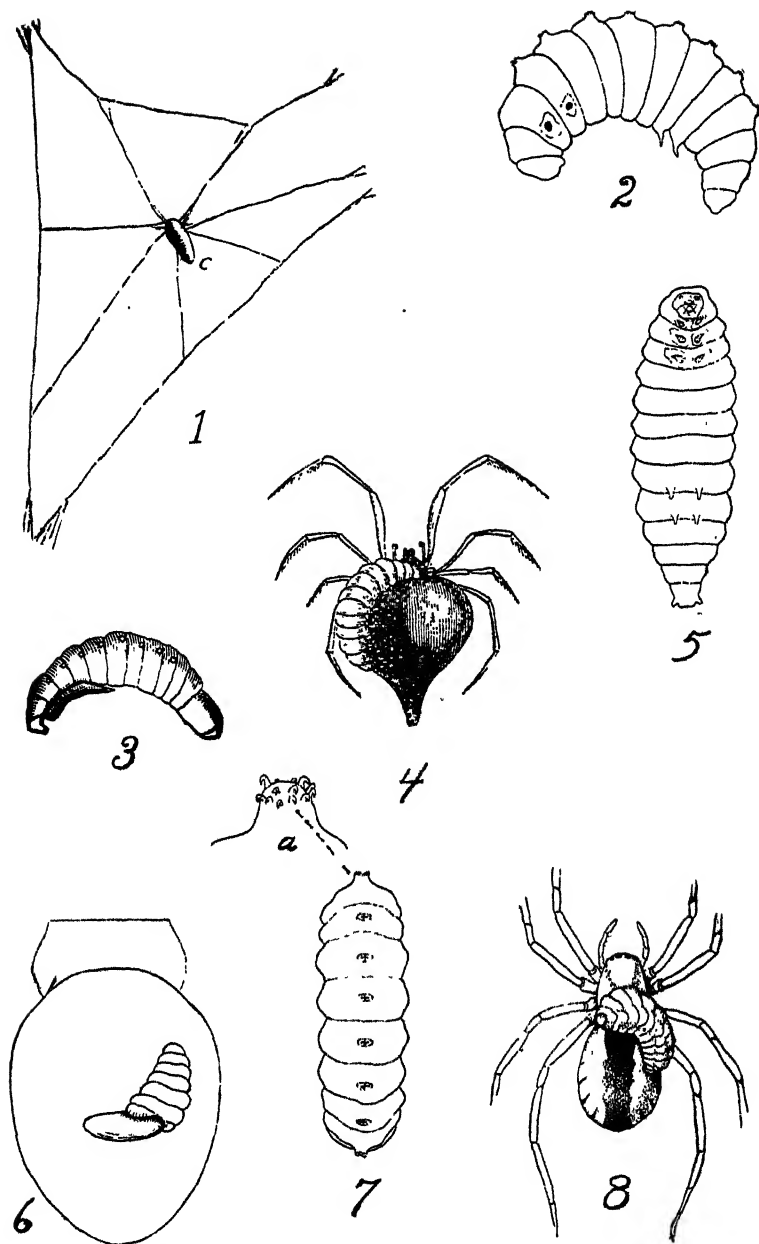
Fig. 1.—Cocoon of a polysphinctine. (After DeGeer.)

Fig. 2.—Larva of *Polysphincta eximia* Schmiedeknecht showing ventral processes for attachment to host—lateral view. (After Nielsen.)

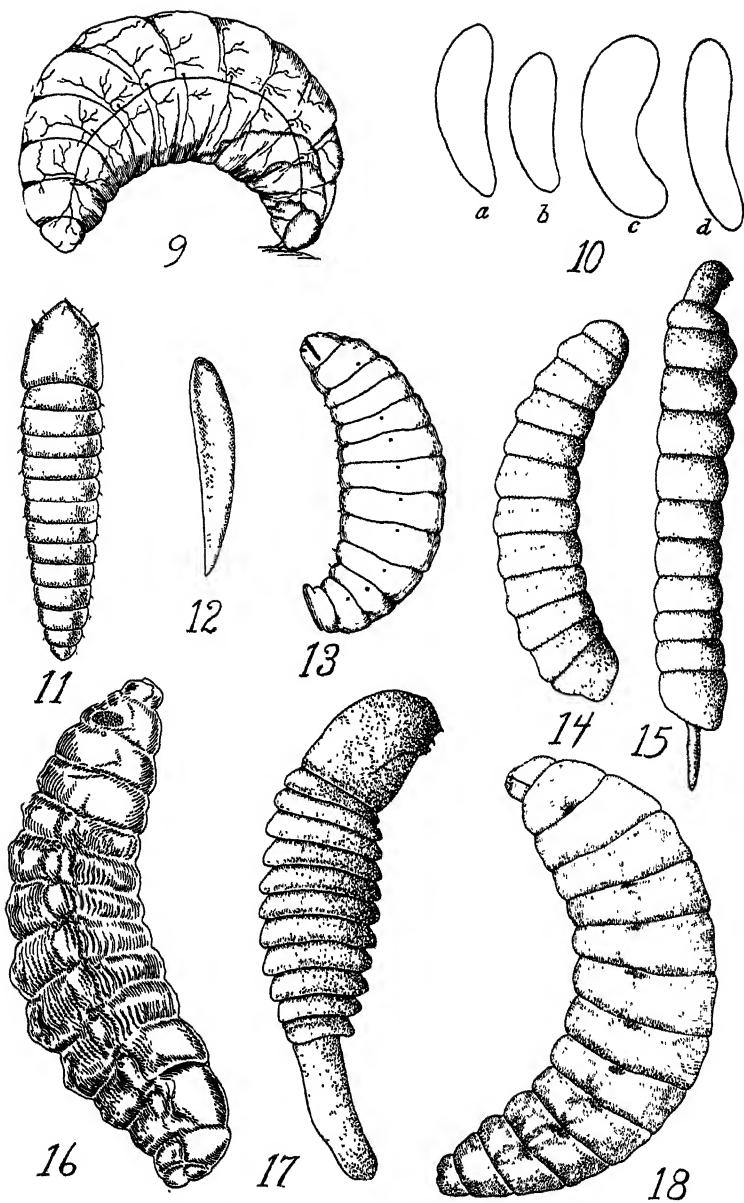
Fig. 3.—*Polysphincta* larva showing attachment to host by means of exuvia. (After Borries.)

Fig. 4.—A Ceylonese spider with its parasite. (After Green.)

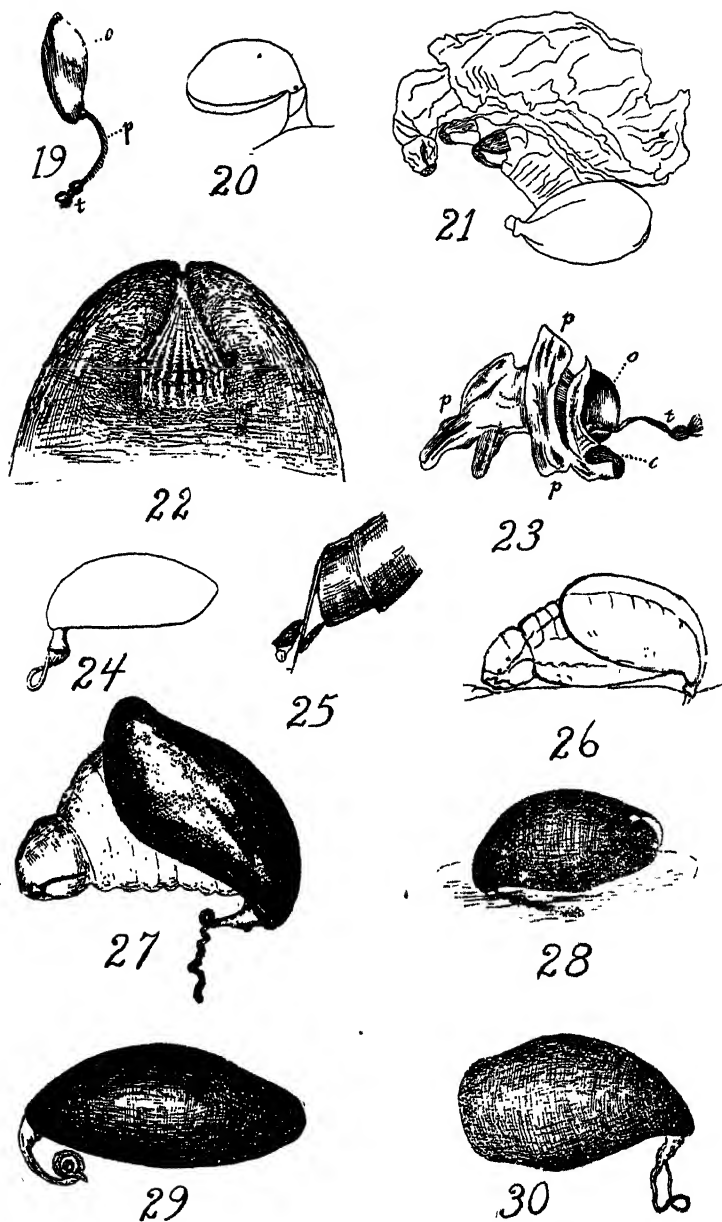
Fig. 5.—Larva of *Polysphincta eximia* Schmiedeknecht showing ventral processes for attachment to host—ventral view. (After Nielsen.)



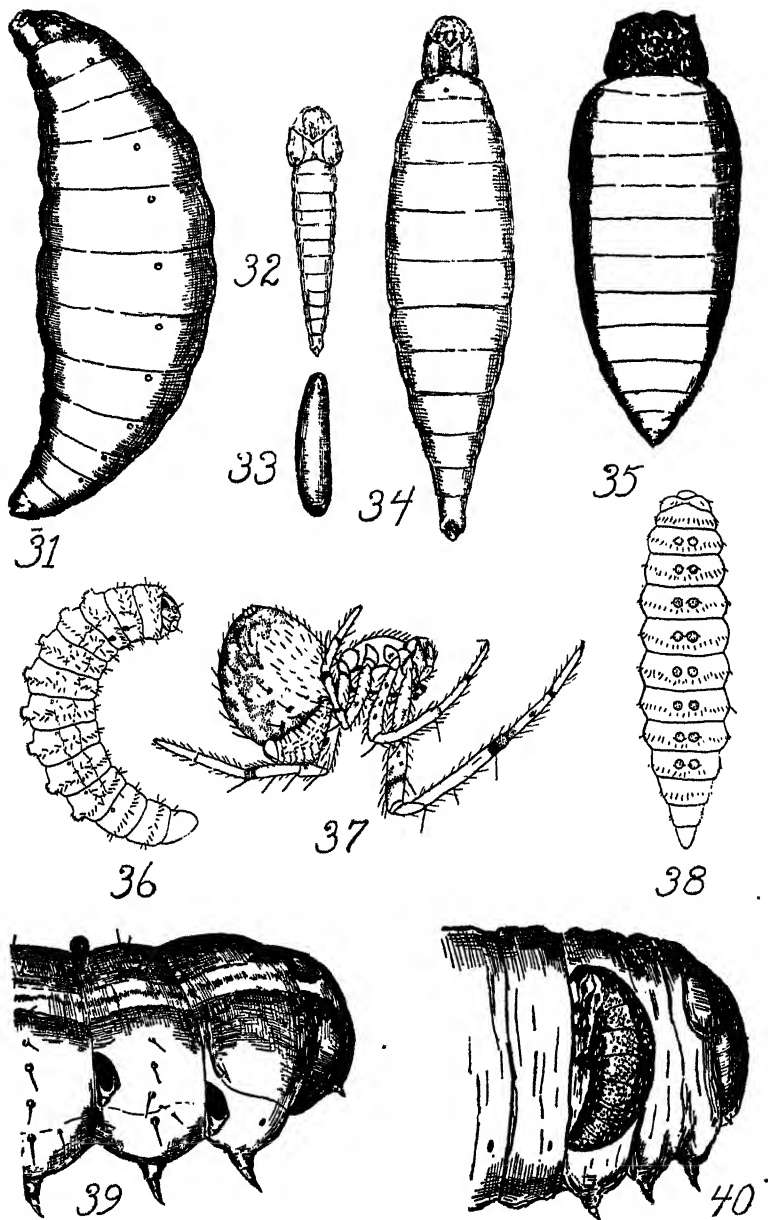
CUSHMAN—SOME TYPES OF PARASITISM.



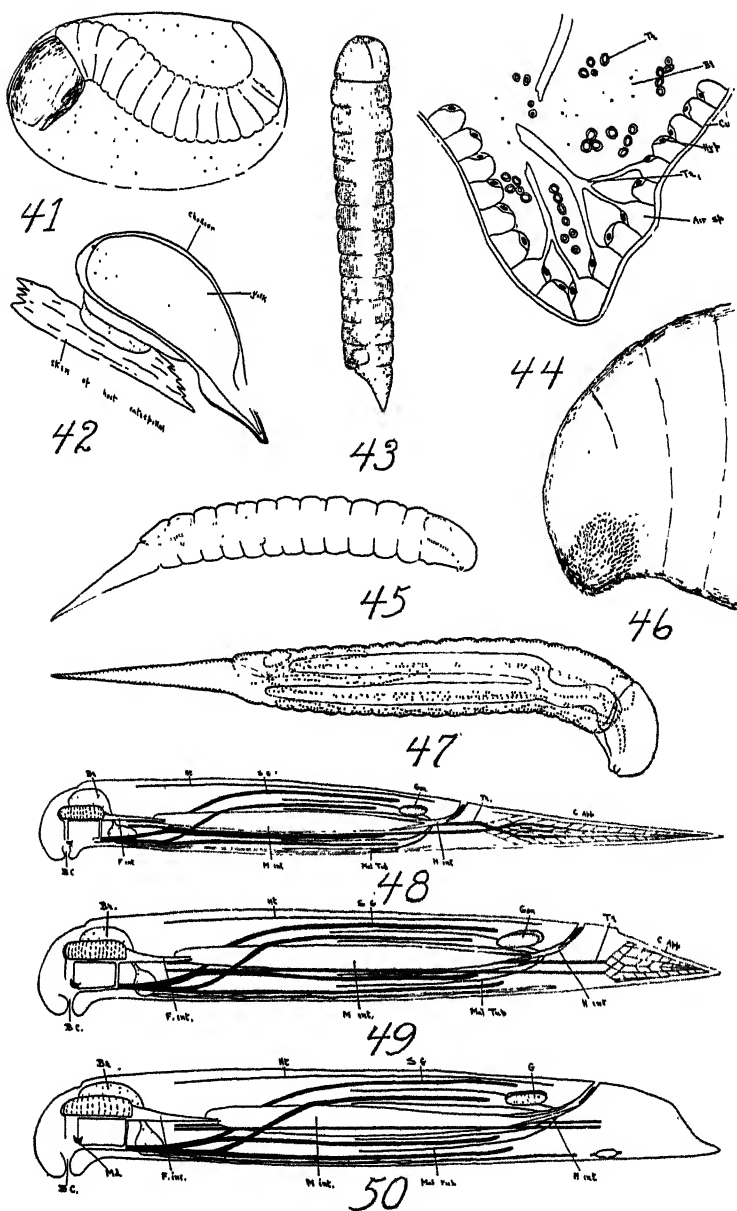
CUSHMAN—SOME TYPES OF PARASITISM.



CUSHMAN—SOME TYPES OF PARASITISM.



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CUSHMAN—SOME TYPES OF PARASITISM.

- Fig. 6.—Newly hatched larva of *Polysphincta clypeata* Holmgren showing part of body still enclosed in egg-shell. (After Nielsen.)
- Fig. 7.—Larva of *Polysphincta eximia* Schmiedeknecht showing "dorsal pseudopods"; *a*—a single "pseudopod" in lateral view. (After Nielsen.)
- Fig. 8.—*Linyphia communis* with larva of polysphinctine parasite. (After Howard.)

EXPLANATION OF PLATE 3.

- Fig. 9.—Fourth instar larva of *Paniscus virgatus* (Fourcroy) showing exuvia of three previous instars. (Redrawn from Newport.)
- Fig. 10.—Forms of eggs of internal parasites: *a*—*Thersilochus conotracheli* (Riley); *b*—*Mesoleius balteatus* Cushman; *c*—*Campoplex tortricidis* Cushman; *d*—*Diocetes obliteratus* (Cresson).
- Fig. 11.—Newly hatched larva of *Calliephialtes* sp. (After Cushman.)
- Fig. 12.—Egg of *Calliephialtes* sp. (After Cushman.)
- Fig. 13.—Full-grown larva of *Paniscus cristatus* Thomson. (Redrawn from Chewyreuuv.)
- Fig. 14.—Second instar larva of *Thersilochus conotracheli* (Riley). (After Cushman.)
- Fig. 15.—First instar larva of *Thersilochus conotracheli* (Riley)—fully fed. (After Cushman.)
- Fig. 16.—Prepupa of *Calliephialtes* sp. (After Cushman.)
- Fig. 17.—Newly hatched larva of *Thersilochus conotracheli* (Riley). (After Cushman.)
- Fig. 18.—Full-grown larva of *Thersilochus conotracheli* (Riley). (After Cushman.)

EXPLANATION OF PLATE 4.

- Fig. 19.—Egg of *Paniscus*. (After DeGeer.)
- Fig. 20.—Egg of *Paniscus pallens* Cushman. (After Cushman.)
- Fig. 21.—Larval exuvia of *Paniscus pallens* Cushman attached to egg-shell. (After Cushman.)
- Fig. 22.—Micropyle of egg of *Paniscus ocellaris* Thomson. (After Chewyreuuv.)
- Fig. 23.—Egg-shell of *Paniscus* with larval exuvia attached. (After DeGeer.)
- Fig. 24.—Egg of *Paniscus testaceus* Gravenhorst. (After Martelli.)
- Fig. 25.—Oviposition of *Paniscus cristatus* Thomson. (After Chewyreuuv.)
- Fig. 26.—First instar larva of *Paniscus virgatus* (Fourcroy). (After Newport.)
- Fig. 27.—First instar larva of *Paniscus ocellaris* Thomson. (After Chewyreuuv.)
- Fig. 28.—Egg of *Paniscus ocellaris* Thomson. (After Chewyreuuv.)
- Fig. 29.—Egg of *Paniscus cristatus* Thomson. (After Chewyreuuv.)
- Fig. 30.—Egg of *Paniscus testaceus* Gravenhorst. (After Chewyreuuv.)

EXPLANATION OF PLATE 5.

- Fig. 31.—Full-grown larva of *Amblyteles vadatorius* (Illiger). (After Chewyreuuv.)
- Fig. 32.—Newly hatched larva of *Ichneumon sarcitorius* Linné. (After Chewyreuuv.)
- Fig. 33.—Egg of *Ichneumon sarcitorius* Linné. (After Chewyreuuv.)

- Fig. 34.—Fully fed first instar larva of *Ichneumon sarcitorius* Linné. (After Chewyreu.)
 Fig. 35.—First instar larva of *Amblyteles vadatorius* (Illiger). (After Chewyreu.)
 Fig. 36.—Larva of *Polysphincta tuberosa* Gravenhorst. (After Nielsen.)
 Fig. 37.—*Theridium punctipes* Emerton with larva of *Polysphincta parva* (Cresson). (Drawing by Eleanor T. Armstrong.)
 Fig. 38.—Larva of *Polysphincta clypeata* Holmgren. (After Nielsen.)
 Fig. 39.—First instar larvae of *Paniscus cristatus* Thomson *in situ* on host. (After Chewyreu.)
 Fig. 40.—Fourth instar larva of *Paniscus in situ* on host showing exuvia of first three instars. (After Chewyreu.)

EXPLANATION OF PLATE 6.

- Fig. 41.—First instar larva of *Therion morio* (Fabricius) in its sac. (After Tothill.)
 Fig. 42.—Egg of *Therion morio* (Fabricius). (After Tothill.)
 Fig. 43.—Second instar larva of *Hyposoter pilosulus* (Provancher). (After Tothill.)
 Fig. 44.—Diagram of tracheation of caudal appendage of young larva of *Therion morio* (Fabricius). (After Tothill.)
 Fig. 45.—First instar larva of *Hyposoter pilosulus* (Provancher). (After Tothill.)
 Fig. 46.—Apex of abdomen of larva of *Paniscus ocellaris* Thomson. (After Chewyreu.)
 Fig. 47.—First instar larva of *Sesioplex validus* (Cresson). (After Timberlake.)
 Fig. 48.—Diagram of first instar of *Hyposoter pilosulus* (Provancher) showing tracheation of caudal appendage. (After Tothill.)
 Fig. 49.—Same, second instar. (After Tothill.)
 Fig. 50.—Third instar of same showing lack of tracheation. (After Tothill.)

CHANGE OF NAME IN ISOPTERA.

By THOS. E. SNYDER, U. S. Bureau of Entomology.

In a paper entitled "New Termites from Guatemala, Costa Rica and Colombia" (Jour. Wash. Acad. Sci., vol. 16, No. 1, pp. 16-28, Jan. 4, 1926), the writer described (p. 23) a termite from Costa Rica under the name *Kaloterms* (*Calcariterms*) *thompsonae*. Since the name *thompsonae* is preoccupied in the genus *Kaloterms* by *K. (Cryptoterms) thompsonae* Snyder (which I have made a synonym of *K. (Cryptoterms) dudleyi* Banks), I therefore propose for *Kaloterms (Calcariterms) thompsonae* the name—

Kaloterms (Calcariterms) fairchildi, new name.

Dr. David Fairchild, Agricultural Explorer of the United States Department of Agriculture, has made important investigations of termites, and I take pleasure in naming this species after him.

A NEW COLEOPHORA FROM NEW YORK (LEPIDOPTERA: COLEOPHORIDAE).

BY CARL HEINRICH, *U. S. Bureau of Entomology.*

The following was received from Mr. E. A. Hartley of the New York State College of Forestry with request for a name.

Coleophora albovanescentis, new species.

Antenna with large basal tuft; white annulated with pale drab brown; basal tuft with a slight ochreous or smoky shading beneath and sometimes above towards extremity. Palpus white with a few pale drab scales along upper edge. Face and head white. Thorax white with a fine median longitudinal line of yellow scales (in type) or a rather broad median yellow patch (in paratypes); tegula white, more or less tinged with yellow at extremity. Forewing yellow striped with white and (in paratypes) with more or less shading of fuscous toward costa and apex; white markings variable, consisting of a rather broad stripe along costa from base to end of cell, another on basal half of dorsum, a thinner and longer stripe along vein 1c, a short median stripe from middle of cell to base of vein 3, a couple of indistinct lines of white scales in apical third and a scattering of coarse white scales at base of cilia (these markings are most pronounced in the type while in one of the paratypes they are overlaid with dark scaling and nearly obsolete); cilia pale glossy brown. Upper side of hind wing and under sides of fore and hind wings a uniform dark brown. Legs white with tarsi faintly annulated; hind tibiae more or less shaded with pale ochreous drab.

Alar expanse.—13–14 mm.

Type.—Cat No. 28924, U. S. N. M.

Type locality.—Cranberry Lake, New York.

Food Plants.—Yellow Birch and Beech.

Described from male type, one male and one female paratypes all from the type locality; the type reared from yellow birch ("7-3-25" E. A. Hartley) and the two paratypes from beech ("7-12-25" and "7-21-25," E. A. Hartley).

The larvae are external feeders and the larval case is of the "pistol" type, black and similar to that of *tiliaefoliella* Clemens, with postol handle turned down abruptly (at right angle with upper edge); upper edge straight; lower edge somewhat irregular; barrel of case broadening towards handle; flaps present, small, appressed; mouth but slightly deflected; 7–8 mm. long.

An easily recognized species. As the species are arranged in Forbes' "Lepidoptera of New York and Neighboring States" (Cornell Univer. Agr. Exp. Sta. Memoir 68, 1923), it would come between *nigralineella* Chambers and *tiliaefoliella* Clemens.

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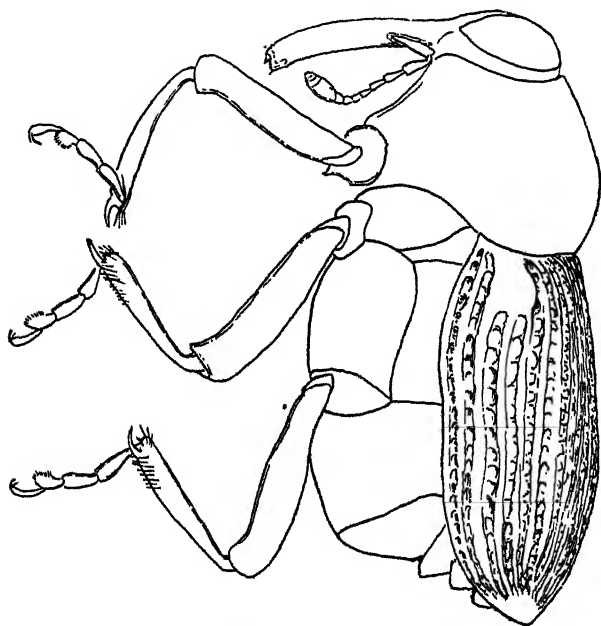
MARCH 1926

No. 3

A NEW COTTON WEEVIL FROM PERU.

BY H. S. BARBER, *U. S. Bureau of Entomology.*

The identification of samples of a small Zygopid weevil, accompanied by larvae, pupae, and parasites, having been requested, the following description is offered to permit the correlation of the two succeeding papers. Dr. C. H. T. Townsend, who submitted the samples, states that the species breeds in cotton, attacking the stem at the surface of the ground, and that the larvae bore to the center of the stalk, causing the plant to fall over.



Eulechriops gossypii, n. sp.

The genotype of *Eulechriops* Faust, 1896, is unknown to me, but the species here described follows the characters given by

Champion, 1906 (Biol. C. A., Coleopt., vol. 6, pt. 5, pp. 109-110), to species Nos. 25-27 of his key, differing in ornamentation from the Central American species which he figures. It also differs from species of this genus known to me through specimens or figures in having the rostrum much less curved, and from the genotype of *Zygomiscus* Casey, 1897, which may not be congeneric with Faust's species, in the rostrum being parallel instead of strongly widened apically, as well as in the more shallowly concave mesosternum.

***Eulechriops gossypii*, new species.**

Elongate-oval, black, feebly shining; feebly ornamented above with suberect, curved spathulate white hairs forming small clusters at hind angles of pronotum, before scutellum, and more prominent on elytral interstices 2 to 5 in basal fifth and on second to fourth interstices at apical third; rest of dorsal vestiture brown decumbent hairs; antennae, legs, and rostrum testaceous, elytral apices and suture faintly rufescent. Length, 2.3-2.5 mm.; width, 1.3 mm. Habitat, Peru.

Rostrum almost straight, slightly flattened, shining, impunctate except in basal fourth (♀) or with punctures decreasing apically (♂); antennae inserted at basal fifth, second funicular joint almost as long as first. Pronotum feebly gibbous posteriorly, coarsely, contiguously punctate, the white scale-like hairs extending narrowly along sides and downward behind eyes. Elytra coarsely sulcate, stria punctures elongate, intervals not wider than striae, flat, and subalutaceous; humeral umbone prominent, convex, and strongly alutaceous; apices separately rounded, slightly extended in a subhorizontal plane behind the subapical gibbosity. Legs slender, femora sulcate beneath, posterior femora not attaining tip of elytra. Mesasternum and abdomen clothed with white scales which are conspicuously smaller, narrower, and denser in a median area on first abdominal segment of the male.

Type locality.—Shomboloa, Julao, near Lamas, Peru. 2,300 feet altitude, Aug. 4, 1925, Townsend.

Type, ♀; and *allotype*, ♂.—Cat. No. 28858, U. S. N. M.

In the male the post-median elytral fascia is somewhat extended laterally by the occurrence of two or three white hairs on interstices 5 to 8. Described from two specimens believed to be ♀ ♂, although not dissected. The accompanying figure was drawn from the male.

**IMMATURE STAGES OF EULECHRIOPS GOSSYPYI BARBER, WITH
COMMENTS ON THE CLASSIFICATION OF THE TRIBE
ZYGOPSINI (COLEOPTERA: CURCULIONIDAE).**

BY ADAM G. BÖVING, U. S. Bureau of Entomology.

INTRODUCTORY REMARKS.

The material from which the following descriptions of the larva and pupa of *Eulechriops gossypii* Barber is made was col-

lected by Dr. C. H. T. Townsend in Julao, near Lamas, Peru, 2,300 ft., August 4, 1925. It consists of three specimens of the larva and two of the pupa, preserved in alcohol, and was sent by Dr. Townsend to the U. S. Bureau of Entomology, together with imagines, for determination and figuring. Mr. H. S. Barber examined the imagines, found that they represent a new species of the genus *Eulechriops*, and has described and named this species in the article immediately preceding this (p. 53). Dr. Townsend records that the insect attacks cotton and that the larvae live in the wood of this plant and kill it.

Of the three submitted specimens of the larva, one is almost straight, but its muscle system, fat system, nerve system, and other body contents are strongly contracted and broken into two portions, which are pushed toward the front and the rear and are separated by a space almost one-fourth the length of the body which is filled only with alcohol. The straight form of this specimen is therefore presumably due to an artificial extension caused by the preservation. The second specimen, on the contrary, is much contracted as if it had been completely dried before it was placed in the alcohol, and it does not offer any suggestion as to the true shape of the larva. The third specimen is strongly curved. All its body areas are distinctly marked; it is neither excessively extended nor shriveled, and is by far the best preserved of the three specimens. Consequently, the accompanying habitus drawing is made from it. However, the larvae of the related genus *Cylindrocopturus*, which bores inside of the stems and roots of large Compositae, are only slightly curved and most likely the living larva of *Eulechriops* has the same shape.

Information about the anatomical details, especially of the head and the spiracles, is gained by dissection of the contracted specimens. Three permanent slides were made and are now in the slides collection of the National Museum.

DESCRIPTION OF MATURE LARVA.

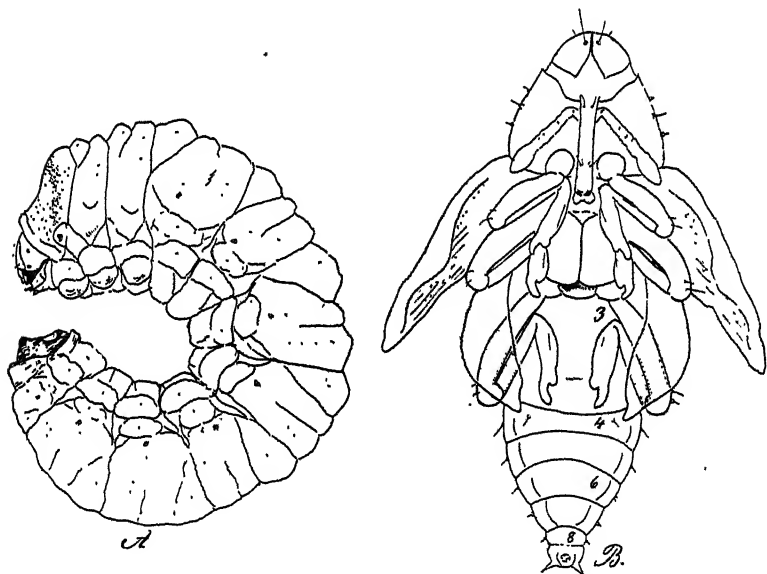
(U. S. Nat. Mus., one vial marked: Julao, near Lamas, Peru. 2,300 ft.

C. H. T. Townsend, 4. VIII, 1925.)

General aspect.

The larva (text fig. A) is about 4 mm. long, cylindrical, and (probably) only slightly curved. The head is elongate-oval, but so deeply retracted into prothorax that less than half of it is exposed. Thorax and the anterior abdominal segments are somewhat larger than the rest and the pedal lobes rather protuberant. The areas of the body are arranged as in the more ordinary type of weevil larvae. The tergum of prothorax is not divided into lobes or pleads; mesothorax and metathorax have two transverse tergal lobes representing

prescutum and the fused scutal and scutellar areas; each of the first five abdominal segments has three distinct and rather protuberant transverse tergal lobes representing prescutum, scutum, and scutellum, and each of the three following segments has also three transverse tergal lobes but they are more indistinctly limited and flattened. The hypopleural lobes are simple in all the segments and there are no distinct intersegmental connecting areas.

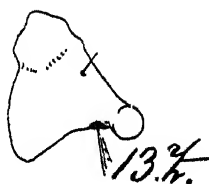
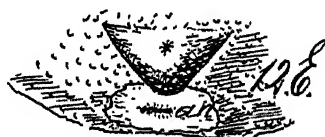
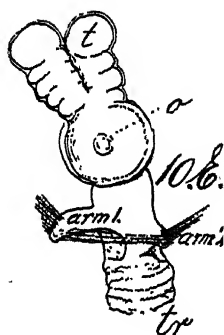
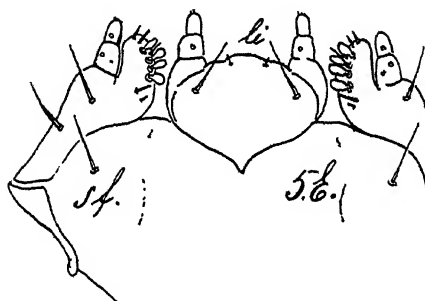
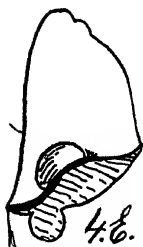
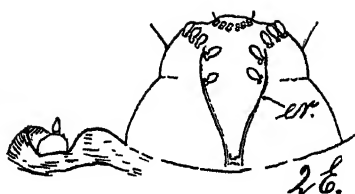


Eulechriops gossypii Barber. A: Larva. B: Pupa. (Drawings by the author.)

The body is mainly whitish but with a slightly yellowish, thinly chitinized, and finely asperate prothoracic shield and with a brownish, strongly chitinized, conical low process at the end of a pale yellowish, thinly chitinized, minutely granulate, and not pleated ninth abdominal segment. The tenth abdominal segment is represented merely by a small, whitish, disk-shaped region below the conical process of the ninth.

Setae are well developed on the head capsule and the mouthparts, but are so minute as to be hardly discernible on the areas of the body and on the foot-warts. The soft-skinned integument seems glabrous, but when examined with high power magnification it is shown to be finely shagreened.

The spiracles (10 E, Pl. 7) are bifore, small, all of equal size, present on mesothorax and the first eight abdominal segments and all lateral. The area in which the mesothoracic spiracle is seated is pushed into the posterior part of prothorax, but is separated by considerable distance from the anterior margin of prothorax. The two air tubes are rather short, each with from four to six incomplete annuli; spiracular opening large and circular. The closing apparatus near the spiracle proper consists of one long and one short arm, a fleshy



fold, and opposite to this a crescent-shaped sharp valve, a contractor muscle between the arms, and two muscles to open the apparatus, one from each arm to the integument of the body.

Anatomical details.—(Plate 7).

Head capsule strongly retracted, but connected with the body by a large cervical collar, and on account of this membrane may be greatly protruded from prothorax when needed.

Epicranial median suture somewhat longer than half of the cranium; epicranial ridges parallel with the outlines of the head, entirely lacking.

Ocelli, two on each side, small, of equal size and both reduced to pigmented spots.

Antennae (1 E and 2 E) small, two jointed. Basal joint (b) membranous, dome-shaped, hardly twice as high as the apical joint and carrying three minute tactile hairs. Apical joint (a) minute, mamillate, somewhat pointed, proximally with ringshaped chitinization; without seta.

Clypeus (2 E) transverse, about twice as wide as long; no setae.

Labrum (2 E) transverse, anterior margin convex, medianly somewhat more than half as long as clypeus, about three times as wide as long, laterally with one well developed, slender seta and anteriorly with one or perhaps two minute setae.

Epipharynx (2 E and 3 E) on each side with (1) a lateral group of three stout, ovate, and basically suddenly constricted setae arranged in an oblique, inwardly, and posteriorly directed row, (2) near anterior labral margin, a median, transverse row of three much smaller but similarly shaped setae and (3) immediately behind the lateral group and inside of the anterior end of the epipharyngeal rod (er) two setae, one in front of the other, of the same size and shape as the lateral setae.

Mandible (4 E and 6 E) strong, subtriangular, with a broad base and heavy dorsal and ventral articulations; distally with an oblique, transverse, slightly bilobed apical edge and facing the buccal cavity with a hollow and gouge-shaped side, which, dorsally, is limited by a convex and, ventrally, by a concave longitudinal marginal edge. One minute seta on the external face.

Maxilla (5 E) with cardo and stipes having the shape, proportional size, and setal armature typical of Curculionid larvae. Maxillary lobe or mala (7 E) large, simple, reaching to the middle of the apical joint of palpus; on the dorsal ("buccal") face about ten setae, of which four are stout, shaped and sized like the large, ovate epipharyngeal setae, and the rest slender and of ordinary type. Maxillary palpus short, two jointed, with distal joint the smaller; sensory punctures present, but no setae observed.

Subfacial area (sf, Fig. 5 E) undivided, probably formed by fusion of the mental, the submental, and the maxillary articulating areas. On each side one well developed and two minute setae.

Labium (5 E) with labial palpigers distinct and chitinized. Labial stipites fused, membranous, posteriorly limited only by a thin, chitinous, biarcuate line and not by a distinct, medianly spearlike, otherwise curved bandlike sclerite as typically found in Curculionid larvae. One long seta present on each side. Ligula thick, short, and with a pair of minute setae.

COMMENTS ON THE TAXONOMIC POSITION OF *EULECHRIOPS* FAUST ACCORDING TO LARVA.

According to characters found in the imago, the genus *Eulechriops* is placed—as listed in Leng's Catalogue of Coleoptera—in the tribe Zygopsini. To this tribe half a dozen North American genera are referred and among them *Zygops* and *Cylindrocopturus*, of which the National Museum possesses immature stages. The larvae of *Zygops* species bore in stems of *Yucca* and *Agave* and have also been found (by H. S. Barber) in the hard wood of an undetermined log in Guatemala. The much smaller larvae of *Cylindrocopturus* (*mammillatus* (Le Conte), *quercus* (Say), *adpersus* (Le Conte), *longulus* (Le Conte) and sp.) are recorded from stems of *Eupatorium*, *Xanthium*, *Ambrosia*, *Iva ciliata*, *Helianthus*, and also from the roots of *Xanthium* and *Heymenopappus flavescens*.

The characters of the larvae of these two genera differ considerably inter se and also from the larva of *Eulechriops gossypii*. There is, however, a fundamental difference between the larvae of *Zygops* and the other two genera, but differences merely of minor systematic importance between the latter. In *Zygops*, for example, the spiracles (9 Z) are bilabiate, but in *Cylindrocopturus* and *Eulechriops* (10 E) bifore and of the same type of bifore spiracles with short air tubes, few annuli, and a large circular spiracular opening. On account of the divergency in the development of this systematic character, the larvae of the three genera do not corroborate the established classification, and *Cylindrocopturus* and *Eulechriops* can not be placed in a tribe together with *Zygops*. The tribe Zygopsini must therefore be reconstructed and a new tribe will probably have to be created for the two excluded genera.

The mandibles, labium, prothoracic tergal shield, ninth abdominal segment, and several less conspicuous characters are also differently developed in *Zygops* and the other two genera, but these characters are mainly generic and no more similar in *Cylindrocopturus* and *Eulechriops*. The principal characters of the larvae of the three genera may be given as follows:

ZYGOPS Schönherr.

Spiracles (9 Z) bilabiate, of medium size, all alike and lateral. Ocellus, one.

Mandible (13 Z) with concave gouge-shaped inner face; distal part of the mandibular body somewhat constricted from the rest; apical edge triangularly bent outward.

Labium (16 Z), with stipites labii slightly chitinized, medianly separated by a longitudinal, strongly chitinized rod.

Prothoracic tergal shield bipartite; each half subtriangular with a somewhat

projecting, strongly chitinized, transverse anterior margin and an acute posterior angle.

Abdomen with three dorsal pleads representing prescutum, scutum, and scutellum well developed on most segments. Intersegmental connecting region not present.

Ninth abdominal segment (15 Z) with a remarkable large, unpaired, median, soft pad (p) situated below anus (an).

CYLINDROCOPTURUS Heller and EULECHRIOPS Faust.

The Principal Characters in Common for the Two Genera.

Spiracles (10 E) bifore; air tubes with about five annuli; all spiracles alike and located on the sides of the body.

Mandible (6 E) with gouge-shaped inner face and apical edge with two teeth. Prothoracic tergal shield slightly chitinized and entire.

Abdomen with prescutum, scutum, and scutellum; no intersegmental connecting regions.

The Principal Characters Separating the Two Genera.

Ocellus in *Cylindrocopturus* one, and obliquely above it a large, disk-like, dark coloration of the otherwise light chitin of the head capsule; in *Eulechriops*, two ocelli.

The two apical teeth of mandible in *Cylindrocopturus* (11 C) more pointed than in *Eulechriops* (4 E).

Club-shaped setae of epipharynx and maxillary mala, in *Cylindrocopturus* distally pointed; in *Eulechriops* blunt.

Labium in *Cylindrocopturus* (14 C) posteriorly enforced with a biarcuate sclerite that medianly is prolonged spear-like; in *Eulechriops* (5 E) no similar chitization.

Ninth abdominal segment in *Cylindrocopturus* (8 C) as normal in Curculionidae; in *Eulechriops* (12 E) with an entire covering of thin chitin and posteriorly above anus (an) with a low, conical, well chitinized, unpaired projection (*).

DESCRIPTION OF PUPA.

(U. S. Nat. Mus., two pupae in vial, together with three mature larvae, marked as given above for the larvae.)

The pupa (text fig. B) is about 3 mm. long.

The head comparatively small, anteriorly rounded, forming a well proportioned completion of the large, conical, strongly attenuate prothorax. The beak and the antennae reach a little behind the front margin of the mesothoracic sternum. The elytra go to the hind margin of the third abdominal sternite and the hind wings extend back to the middle of the fourth abdominal sternite. The front legs are completely exposed, the middle legs partially hidden on their inside by tibia and tarsus of the front legs, and the hind legs are covered exteriorly by the wings. The apex of the tarsus of the hind legs is almost even with the hind margin of the third abdominal segment, but does not reach it. The

abdomen as long as the entire anterior half of the body, elongate oval, with the small eighth and ninth segments somewhat contracted. Third abdominal sternite very large and as long as the following four sternites together; ninth abdominal segment armed on each side with a prominent pleural spine.

The setae are distributed as follows:

On each side of the head are (1) one long seta between the eyes, (2) one short seta near vertex, (3) one at the base of the beak, (4) two near the middle of the beak.

On each side of the pronotum are (1) one seta close to the anterior margin of pronotum and near to the longitudinal middle line, (2) one seta in the transverse middle line and between the longitudinal middle line and the lateral margin of pronotum, (3) one seta slightly in front of the transverse middle line and close to the lateral margin, (4) one seta slightly behind the transverse middle line and close to the longitudinal middle line, (5) a transverse row of three setae midway between the transverse middle line and the posterior margin of pronotum, and (6) just outside of this transverse row a longitudinal row of three setae in the lateral margin of pronotum.

On each side of the mesonotum are two setae transversely placed beside each other between the longitudinal middle line and the lateral margin of the mesonotum.

On each side of the metanotum two setae placed as are the two of the mesonotum.

On the abdominal segments are no dorsal spines or setae, one lateral seta on each pleurum of the fourth to eighth segments, and one ventral seta on each side of the sternum of the fourth.

Femur of each leg with two setae near the distal end.

Spiracles, nine, laterally placed on each side of the body.

The last cast skin of the larvae adheres to and covers the three terminal abdominal segments of the pupa.

COMMENTS ON THE TAXONOMIC POSITION OF *EULECHRIOPS* FAUST ACCORDING TO PUPA.

The pupa of *Cylindrocopturus (adpersus)* deviates somewhat from the pupa of *Eulechriops (gossypii)* in having rather stronger and longer setae and also in having them arranged slightly differently, but especially by possessing a transverse row of two or three distinct tergal setae on each side of the first to seventh abdominal segments and one seta on each side of the eighth tergite. All these tergal setae were lacking in *Eulechriops*, but otherwise the pupae of the two genera are very similar in the general shape of the body, the proportional size of the appendices, and all the anatomical details.

The pupa of *Zygops* differs considerably from both of these pupae. The proportionate length of the hind legs to the rest of the body in the three genera is not the same; for in *Zygops* the distal ends of the femora reach to the seventh abdominal segment and extend far behind the tips of the wings, which go

to the fourth abdominal segments as in the two other genera. The setae of *Zygops* are also stronger, spine-like, and more numerous; for instance, six on each side of the head instead of two as in *Eulechriops* and *Cylindrocopturus*, and about five on each side of most of the abdominal terga. Its seventh abdominal segment carries on each side of the body a large disk-like tergal plate with a transverse row of six strong, spine-like setae; the ninth abdominal segment is armed with a pair of large, long, and strongly chitinized pleural spines and the tenth abdominal segment has a well developed, short, blunt spine-like seta on each side.

Altogether, the development of the pupae of the three genera supports the taxonomic view gained from the comparative study of their larvae, namely, that a rather close relationship exists between *Eulechriops* and *Cylindrocopturus* but not between these and *Zygops*, and that the former two genera are wrongly placed in the tribe Zygoipsini.

EXPLANATION OF PLATE 7.

(Drawings by the author.)

1. E. *Eulechriops gossypii*. Antenna: a, apical joint; b, basal joint.
 2. E. *Eulechriops gossypii*. Epipharynx: er, epipharyngeal rod.
 3. E. *Eulechriops gossypii*. Setae of epipharynx much enlarged; er, epipharyngeal rod.
 4. E. *Eulechriops gossypii*. Mandible, dorsal face.
 5. E. *Eulechriops gossypii*. Ventral mouthparts; li, ligula; sf, subfacial region.
 6. E. *Eulechriops gossypii*. Mandible, exterior face.
 7. E. *Eulechriops gossypii*. Maxillary mala with setae; buccal face.
 8. C. *Cylindrocopturus adspersus*. End of abdomen. an, anus; (*), part of ninth abdominal tergite right above anus.
 9. Z. *Zygops* sp. Spiracle.
 10. E. *Eulechriops gossypii*. Spiracle; o, spiracular opening; tr, trachea.
 11. C. *Cylindrocopturus adspersus*. Mandible, dorsal face.
 12. E. *Eulechriops gossypii*. Distal end of abdomen; an, anus; (*), conical process of ninth abdominal tergite right above anus.
 13. Z. *Zygops* sp. Mandible, ventral face.
 14. C. *Cylindrocopturus adspersus*. Labium; sf, subfacial region.
 15. Z. *Zygops* sp. Distal end of abdomen; an, anus; p, membranous pad of tenth abdominal segment below anus; (*), part of ninth abdominal segment above anus.
 16. Z. *Zygops* sp. Labium.
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A NEW UROSIGALPHUS PARASITIC ON EULECHRIOPS GOSSYPH BARBER (HYMENOPTERA: BRACONIDAE).

By R. A. CUSHMAN *U. S. Bureau of Entomology.*

With the types of *Eulechriops gossypii* Barber from Peru received from Dr. C. H. T. Townsend were a male and a female of the following new *Urosigalphus*.

***Urosigalphus eulechriopis*, new species.**

Female.—Length, 3 mm. Head strongly transverse; temples sloping, weakly convex, densely punctate; vertex punctate at temples, with an impunctate area posteriorly, a sharp ridge on inner side of each lateral ocellus; scrobes shallow, polished; face with small sparse punctures, medially with a small tubercle from which a shallow groove extends upward between the antennae; eye about three-fifths as long as width of face; clypeus broadly truncate at apex, the truncature about twice as long as clypeus; antennae 14-jointed, about as long as head and thorax, basal joints of flagellum more than twice as long as thick, subapical joint little longer than thick and little more than half as long as last joint. Thorax mostly coarsely irregularly rugose, only the middle of mesopleurum polished and lateral lobes of mesoscutum punctate, prescutum with a high median ridge anteriorly from which another ridge extends laterally on each side; posterior face of propodeum bounded by a very high carina, dorsal face divided medially by a short carina; stigma very broad, its anterior margin strongly curved; radius complete, radial cell barely as long on metacarpus as stigma. Abdomen coarsely longitudinally rugose, the interspaces punctate, rugae fading out posteriorly, carapace at apex with two long, slender, but not acutely pointed tubercles; ovipositor sheath about half as long as abdomen.

Black; mandibles, front and middle legs and hind trochanter testaceous, hind legs otherwise piceous; wings hyaline, venation brown, stigma pale at base.

Male.—Essentially like female but antennae longer and more slender, joints beyond middle two or more times as long as thick.

Host.—*Eulechriops gossypii* Barber.

Type locality.—Julao, near Lamas, Peru.

Type.—Cat. No. 28,865, U. S. N. M.

Described from one specimen of each sex mounted on same pin, reared by C. H. T. Townsend.

In spite of the fact that the ocellar space is not pyramidal this species is most closely related to *anthonomi* Crawford, to which it is very similar in structure and sculpture. The interocellar ridges evidently indicate the origin of the elevation characteristic of *anthonomi* and certain other species of the genus.

ANTHRENUS SEMINIVEUS CASEY (COLEOPTERA).

BY E. A. BACK AND R. T. COTTON, *U. S. Bureau of Entomology.*

In 1916 the late Col. Thos. L. Casey described as new the Dermestid, *Anthrenus seminiveus*, from an adult beetle captured in his laboratory on Connecticut Avenue N. W., Washington, D. C. The new dermestid is conspicuously marked with patches of white and black scales, with yellow scales less in evidence. It closely resembles the furniture beetle, *Anthrenus fasciatus*, which is marked with patches of orange, white and black scales, among which the orange scales are very much in evidence. So far as the writers are aware, the description by Col. Casey is the only reference published regarding *seminiveus*.

It is interesting, therefore, that after about ten years two instances of destruction caused by this insect should be brought to the attention of the Department of Agriculture within a short time of each other during late 1925. In one instance the brushes of a shoe polishing outfit were ruined, as indicated by the illustrations of Plate 8. This injury was done in an apartment hotel about half a mile from the building in which Col. Casey lived. The second instance of injury occurred in the building in which he lived and took place in a divan or couch upholstered in curled hair, Spanish moss and tow. The covering of the furniture was of cotton fabric, hence the only indication of infestation was the flabbiness of the covering, coupled with the escaping adults and larvae. Through the courtesy of the apartment house management, the writers were given the privilege of pulling the furniture to pieces. This was done and it was found that the flabbiness had been caused by the fact that the hordes of larvae had almost completely eaten away the layers of curled hair. In removing the cloth cover of the back of the couch, more than 3,000 adults and 671 well-grown larvae were counted—all in a portion of the furniture where no food existed, but into which they had crawled in seeking a means of escape. In all 16,397 adult beetles and 10,002 well-grown larvae were counted in the furniture, and it was estimated that the *seminiveus* population, including the many immature larvae and eggs, was not less than 100,000.

EXPLANATION OF PLATE 8.

Anthrenus seminiveus Casey. Injury by larvae to polisher (a) and applicator (b) of a shoe polishing outfit. The manner in which larvae congregate for moulting and the tendency for the cast larval skins to adhere and form festoons is shown in (c), a portion of the polishing cloth belonging to the outfit.



BACK AND COTTON—ANTHRENUS SEMINIVEUS.

A NEW EGG-PARASITE (HYMENOPTERA: SERPHOIDEA).

By A. B. GAHAN, U. S. Bureau of Entomology.

Telenomus cosmopeplae, new species.

Extremely similar to *T. utahensis* Ashmead from which it differs only in that the first funicle joint is slightly shorter than the pedicel and the mesoscutum is very slightly less strongly sculptured, its posterior margin without any semblance of longitudinal striations along the suture separating mesoscutum and scutellum. In *utahensis* the first funicle joint is slightly longer than the pedicel, and the mesoscutum is strongly sculptured, its posterior margin along the suture being indistinctly longitudinally striated.

Female.—Length, .83 mm. Head as broad as thorax or a little broader, thin antero-posteriorly, finely reticulate-punctate or shagreened, the frons mostly polished but with its lateral margins and the lower half weakly reticulated; occiput weakly margined; head viewed from in front broader than high, subtriangular; antennae strongly clavate, 11-jointed; scape slender; pedicel not twice as long as thick; first flagellar joint very slightly narrower and a little shorter than pedicel; second joint of flagellum shorter than the first, usually about as long as thick; third flagellar joint usually a little broader than long; fourth and following joints, except the apical one, strongly transverse; apical joint conical and about as long as broad at base; thorax as broad as long, nearly circular in outline as seen from above; pronotum concealed; mesonotum broader than long, finely and uniformly reticulate-punctate, very slightly shining, and covered with short grayish pubescence; scutellum more than twice as broad as long, polished or with only very faint reticulation, pubescent like the mesoscutum, the suture at base not foveolate; postscutellum distinctly foveolate; propodeum perpendicular medially; wings a little longer than the whole insect, the signal vein about half as long as postmarginal; abdomen nearly as broad as long, rounded at apex, the second tergite much the largest, first and basal two-thirds of second tergites longitudinally striated, the apex and broad lateral margins of second polished; tergites beyond the second mostly polished. Black, wings hyaline; antennae including scape black; legs mostly black; all trochanters, front tibiae, base and apex of middle and hind tibiae, and the three basal joints of all tarsi reddish testaceous.

Male.—Length, .70 mm. Similar to the female except for the antennae. Antennae 12-jointed, not clavate; scape cylindrical; pedicel small, barely longer than thick; first flagellar joint longer and a little thicker than pedicel; second joint slightly longer than the first and of the same thickness; third joint equal to the first in length and thickness; fourth to penultimate joints moniliform, subquadrate; apical joint conical and about twice as long as broad at base.

In both sexes the middle and hind tibiae as well as the front pair are sometimes mostly brownish testaceous.

Type locality.—Urbana, Illinois.

Type.—Cat. No. 28,990, U. S. N. M.

Nine females and three males received from W. V. Balduf and said to have been reared from eggs of *Cosmopepla bimaculata* Thomas, August 8, 1925.

INSECT TAXONOMY: PRESERVING A SENSE OF PROPORTION.

BY W. L. McATEE, *U. S. Biological Survey.*

Consider the *Ailanthus* tree, its sturdy though smooth trunk, its few but strong branches, and their moderate division into twigs. A simple structure, but what a glorious crown of foliage it bears—leaves relatively few in number, yet ample in size, and with their numerous leaflets rivalling the ferns in symmetry and beauty. Well named by the Chinese, Tree of Heaven.

Consider on the other hand the *Ephedra* with its insignificant trunk, and numerous slender green branches usurping the function of leaves, which in this plant are reduced to harsh scales. A complex but barren structure—such is the Syphilis Bush.

The parable¹ we would draw is the application of the contrasted plans of *Ailanthus* and *Ephedra* to the taxonomy of insects. Let the trunk of our phylogenetic tree represent the Class of Insects. Its limits in general are agreed upon and no one seriously proposes to alter it. The first divisions of the trunk like the strong limbs of *Ailanthus*, or in fact as the primary divisions of any complex should be, are relatively few in number, sturdily constituted, well rounded, and impressive. They represent the Orders of Insects. Multiplication of them weakens the structure and should not be contemplated except for the weightiest reasons. Not one entomologist in a thousand will have adequate reason for even considering the recognition of a new order of insects.

The twigs are the families and in insect taxonomy a moderate number of them provides ample attachment for a wealth of genera and species, the foliage of the tree of classification. Families, the second order of division of the Class of Insects, are in consequence groups of great importance and therefore not to be increased in number upon immature consideration. Experience proves that thoroughgoing investigation of the members of a given order over the whole world is likely to reveal intergrading forms that render the recognition of relatively few and comprehensive families not only the most convenient, but the most natural arrangement.

The genera of the tree of life on the *Ailanthus* model are petioles of generous dimensions, bearing numerous leaflets—the species. Such genera are real *groups* of species,—according with the true definition of the term, and we believe, with the manifestations of insect development in the majority of instances. While monotypic genera, in some cases, are necessary, the tendency to erect genera for single species, having peculiar adaptive characters, should be resisted. Structure, not biology;

¹Like most parables, the present one is intended to be of broad and general, not necessarily of specific and literal, application.

is the basis of insect classification and for a long period in the future we will be ignorant of the biology of most of the forms we deal with. Therefore, let the classification be such that it will apply to all on the same terms. The use of sexual characters for defining genera also is to be deplored. It is as much as can be endured to use these characters of which we do not actually know the significance,¹ for the differentiation of what we take the liberty of calling species. Often we must put aside as an unknown mass, specimens of the sex which does not show our "characters," or if both sexes have strong "characters," likely enough we give actual mates distinct "specific" names. Such usage, we repeat, is bad enough in the case of "species," and should be entirely taboo for the much more important category of genus. If we can not place all sex forms of an insect in their proper genera on structural characters,² then we have too many genera. Recognition as genera, of groups of species allied in color pattern, and regardless of affinities in structure, is puerile, and all multiplication of genera for its own sake is highly undesirable. The inevitable product of such a process is monomial nomenclature, and it is safe to say that no one is going to be hailed as a second Linnaeus for urging such a nomenclature or anything approaching it.

A phylogenetic structure on that plan, one species to a genus, one genus to a twig would resemble the *Ephedra* with its multiplied branches, subdivided into twigs which taper into separate almost thorny tips, forming a rigid, graceless, forbidding mass. How inviting by contrast is the luxuriant and well-ordered foliage of the *Ailanthus*. Here the numerous leaflets (species) arranged upon strong petioles (genera) produce those mass effects that are so agreeable in appearance and so characteristic of the most highly developed arboreal forms.

Consider the leaflets of *Ailanthus*, their number, their serried rows; they are alike in general structure, similar in appearance, and identical in color, yet each can be distinguished by details of form. What a perfect model for the structurally characterized species of a well-conceived genus. The *Ailanthus* leaflets teach us the ease of distinction regardless of color, and the entomologist needs only once to work out the classification of a group of species of uniform coloration, to realize how unnecessary it is to depend upon color for the differentiation of species. Dependence upon the more variable color characters is not only unnecessary but unsafe, and the day when simple color descriptions of species can be considered adequate has long passed.

¹For instance, in the crayfishes the primary sexual characters, i. e. the claspers, are known to be polymorphic in a species.

²Not necessarily the same characters, nor does this remark apply to groups where in general only one sex is available for study.

Isolated descriptions of insect species sometimes a necessity, are regarded as an unfortunate by-product of modern insect taxonomy. As an object in themselves such descriptions are scarcely worth consideration, and if launched without keys, comparative notes, or illustrations, had better be suppressed. Revisional, constructive, in other words, genuinely useful work is the ideal of the modern taxonomist, and it is a good one to treasure, to live up to, and even to sacrifice for if need be.

To sum up: thoughtful consideration of the taxonomic sequence, species, genus, family, order, and class, should convince one that the species is a significant, and the genus an important, element in the classification of insects. To contribute to a desirable type of phylogenetic tree, what is mainly needed is exercise of a sense of proportion. Let the vital members of the structure be sound and of full value; relegate all minor, intermediate, and variable elements to the "sub" categories, where they will not necessarily claim attention. Going back to our plant simile, will the tree of life you help to build resemble the well-proportioned and admirable Tree-of-Heaven, or will it imitate the scraggly and barren Syphilis Bush?

MELANOPLUS BOREALIS IN NEW YORK STATE (ORTHOPTERA: ACRIDIDAE).

BY A. N. CAUDELL, *U. S. Bureau of Entomology.*

During the past summer specimens of *Melanoplus borealis* Fieber were submitted to the writer for determination by Prof. J. D. Hood of Rochester, N. Y. As this species does not appear to have been reported from New York this occurrence seems worthy of record, though from the known range of this grasshopper its occurrence in that State was to be expected. These specimens were taken in a Sphagnum swamp near the Oswegatchie River in the Adirondacks and on an early date, June 17, a locality and date characteristic for this species. The collector has furnished the following note: "This species was found in some abundance along the Oswegatchie River, in the Adirondack region of New York, where the fauna and flora show decided boreal affinities. We found it very good bait for the big brown trout in the deep, quiet pools; and each cold morning a goodly number of individuals was taken for that purpose. They were just reaching maturity, and not more than half were adult by June 15. All specimens were taken from grass and other vegetation growing in the sphagnum bogs which dotted the flood-plain of the river."

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**CONDITION OF THE COLEOPTEROUS COLLECTION OF THE
NATIONAL MUSEUM IN 1906.¹**

By E. A. SCHWARZ, *U. S. Bureau of Entomology, Washington, D. C.*

Shortly after the death of Mr. Martin L. Linell, Aid to the Division of Insects of the U. S. National Museum, which took place in May, 1897, Mr. E. A. Schwarz was ordered by the Honorary Curator to take charge of the collection of Coleoptera, and shortly afterwards he was appointed Custodian of Coleoptera. Since that time Mr. Schwarz has been constantly employed in the National Museum, excepting for such periods as when he was absent on official trips.

No account has ever been taken of the number of specimens, or even species of Coleoptera at the Museum. As to the number of specimens, it is quite impracticable to give even an estimate. It may be said, however, that the number of

¹Twenty years ago the accompanying paper was submitted to Dr. Howard, Honorary Curator of Insects of the National Museum, as a basis for a report on the condition of the collection of Coleoptera in the National Museum. Because the report contains much interesting information and gives a valuable historical background showing the growth of the collection of Coleoptera of the National Museum, it does not seem to be advisable to have it remain buried in the files. It was written without any intention that it should be published and very admirably portrays the characteristics of its author. Since this report was prepared, very many changes have taken place in the collection and it has gone far beyond the expectations of Dr. Schwarz. Throughout the report there are repeated statements of the lack of sufficient boxes and drawers in which to house the collection and one would naturally expect to find such statements since the intent was to emphasize the need of more facilities for housing the rapidly growing collection. The belief is stated that it would be necessary to have 500 drawers to satisfactorily house the collection of North American Coleoptera. Of the 1722 drawers used for Coleoptera, the North American series is now stored in about 800 drawers and some large groups are still in Schmidt boxes. The collection is growing so rapidly that we can look forward to its occupying a very much larger number of cases in the near future. The arrangement of the collection has also changed somewhat since 1906, and the personnel which has been working on it has increased remarkably during this interval. All of these facts can be brought out very nicely in a supplementary report.

—S. A. Rohwer.

specimens of Coleoptera exceeds many times that of all other orders of insects in the Museum collections. As to the number of species, a rough, but very conservative estimate shows that there are at present about 35,000 species in the collection of which about 22,000 have been determined. The North American fauna is extremely well represented, while the faunae of foreign countries are for the present more or less poorly represented excepting the West Indian and Central American regions. The collection includes about 500 types or co-types described by various authors mostly from the North American collection.

The accessions received since 1897 have been of such magnitude that only with the utmost effort it has been possible to do the mechanical mounting and labeling of specimens—in fact the custodian would not have been able to perform this tedious work except by the assistance furnished from time to time by the Bureau of Entomology of the U. S. Department of Agriculture in placing at his disposal temporary help. It must be acknowledged that the assistance given by the present Aid to the Division of Insects, Mr. Herbert S. Barber, has been of incalculable value; Mr. Barber, besides performing his multifarious duties in other lines, spending a great deal of his free time in the working up and care-taking of the collection of Coleoptera.

Another drawback of considerable weight is the lack of proper boxes and lack of space in which to put the boxes. This condition of affairs has reached a point where it will not longer be possible to increase the collection or take care of that part which is either entirely or partially arranged.

The collection of Coleoptera of the National Museum is placed upon a basis different from the collections of other museums, from the fact that it is more frequently called upon for the determination of specimens than any other large museum either in America or in the Old World. The collection is not only called upon to furnish determinations for most of the agricultural experiment stations in the country and to the numerous correspondents of the Bureau of Entomology of the Department of Agriculture, but also for official and private entomologists in foreign countries. This work takes away such a considerable time of the Custodian that, unassisted as he is, he is unable to describe species or do original systematic work for which otherwise the large collections accumulated at the Museum furnish excellent material.

To facilitate the work of furnishing determinations for outside parties, it has been absolutely necessary to arrange the systematic collection according to geographical distribution: a collection of North American Coleoptera, the most important

and the most frequently used collection, is kept in separate series of boxes; a collection of West Indian material has been formed; also a collection of Central American species, of the Coleoptera of the Hawaiian Islands, of the Philippine Islands, and the rest of the collections from other foreign countries is also arranged according to geographical distribution.

In two families of Coleoptera an attempt has been made by the Custodian to form a general systematic collection containing the genera and species of the whole world arranged in systematic order. These are the Cicindelidae and the Lucanidae. Of the former family, the well-known authority, Dr. Walther Horn of Berlin, Germany, has donated to the Museum a large number of species from various countries, and these, together with the Museum material, were arranged according to the latest catalogue of this family. It comprises at present 30 genera with 203 exotic species, and a nearly full set of the N. A. species. Unfortunately there were no regular Museum drawers available, and the collection had to be placed in Schmidt boxes. The recent publication of a catalogue of the Lucanidae of the whole world, by Mr. van Roon, was the reason for bringing together the whole material of this family, and it was found that of 76 genera and 722 species enumerated in that catalogue the Museum possesses 36 genera and just one hundred species.

At the present time, the collection in charge of the Custodian of Coleoptera is divided into three groups: first the systematic collection; second the biologic collection, and third the microscopical collection.

SYSTEMATIC COLLECTION:

NORTH AMERICA.

Shortly after the appointment of Mr. Schwarz as Custodian, the large Hubbard and Schwarz collection was donated to the Museum by the owners, and by its accession the Museum collection of North American Coleoptera was at once brought into the foremost rank, the number of species and the large sets of specimens in each species being unequalled by any other private or public collection here or abroad. No effort has been spared by the Custodian to maintain this position. The number of important accessions received since 1897 has fully accomplished this purpose. Following are the more important and larger accessions just referred to:

A collection made by Messrs. Hubbard and Schwarz in southern Arizona in the year 1898. This collection includes also valuable material in other orders of insects, the most complete portion, however, being the Coleoptera. The collection was mounted and labeled by the Custodian during his

private time, and has been incorporated into the systematic collection.

The Soltau collection of North American Coleoptera. Mr. Hugo Soltau, of New York, an old correspondent of Messrs. Hubbard and Schwarz and an enthusiastic collector of Coleoptera, willed his collection to the gentlemen just named, and upon his death the collection was turned over to Mr. Schwarz (Mr. Hubbard having since died) and transmitted by him at once to the National Museum. This collection has proved to be of extreme value to the Museum collection, not so much on account of the large number of species new to the Museum, but on account of large and carefully labeled series from sections of the country from which hitherto very little material was represented in the Museum, namely, the States of Alabama, Mississippi, Kentucky and Iowa. The specimens of that collection, numbering many thousands, as far as they were properly mounted and labeled, have been incorporated into the systematic collection. A large proportion of the other specimens have been mounted and labeled, and also incorporated, but a portion of the Soltau collection, mounted in a provisional manner, still required a good deal of manual labor before it can be incorporated.

The Barber and Schwarz collection, made in 1901 by Mr. H. S. Barber and E. A. Schwarz in the plateau region of Arizona and in parts of New Mexico. The cost of this expedition was partly borne by the Bureau of Entomology and partly furnished from private sources. The many thousand specimens comprising this collection and representing all orders of insects but chiefly Coleoptera, were mounted and labeled by the Custodian with the assistance of Mr. H. S. Barber, who was then in the employ of the Department of Agriculture. The specimens have most of them been named, but a small proportion only could be incorporated into the systematic collection on account of the crowded condition of the boxes.

The collection known as the Harriman Alaskan collection, made by Mr. Trevor Kincaid in various parts of Alaska, has been turned over to the Museum. It has been arranged and determined by the Custodian, and the list of species was published in the insect series of the Harriman Alaska Expedition. The collection did not add a large number of species new to the Museum, but is exceedingly valuable as illustrating the Coleoptera fauna of that region.

The Turner collection from northern Labrador. Mr. L. M. Turner, an employee of the Signal Corps of the U. S. War Department, made this collection many years ago at Ungava Bay, northern Labrador. The collection, consisting of all orders of insects, was mounted and labeled by the assistants of the Division of Entomology of the U. S. Department of Agriculture,

but Mr. Turner, on account of reasons which need not be mentioned here, failed to turn over the collection to the Museum. He died shortly afterwards and the collection, which was pinned in a number of Schmidt boxes, was lost sight of for many years. It was finally found in the cellar of the Smithsonian Institution and turned over to the Museum. The Hymenoptera of this collection had been utterly destroyed during this long interval by museum pests, and the same fate befell the Lepidoptera. The Diptera were in tolerably good condition, while the Coleoptera were found to be considerably injured by mold. On account of the extreme value of this collection, the Custodian spent considerable time in washing and cleaning the specimens and succeeded in saving all but a small portion of the smaller and more delicate specimens. The Coleoptera have been named and distributed in the systematic collection, and a list was made and preserved in the archives of the Division of Insects, but has never been published.

The Barber collection from Humboldt County, California. Taking advantage of the cheap railroad fare to California on account of the meeting of the American Ornithologists at San Francisco, Dr. L. O. Howard, Chief of the Bureau of Entomology, furnished means for Mr. H. S. Barber to proceed to northern California in order to make insect collections from a region which was not before represented in the Museum. A large number of species of all orders were brought back by Mr. Barber, mounted and labeled by himself. The Coleoptera were best represented in this collection, and were determined by the Custodian and distributed in the systematic collection. A separate list of them was made but has not yet been published.

The Plummers Island collection. This is a unique collection of great value, made by various members of the Washington Biologists' Field Club on Plummers Island, Maryland, situated in the Potomac River about ten miles west of Washington, D. C. This collection, comprising many thousand specimens and extending over the whole domain of entomology, is being constantly added to as far as the short visits of the members to the Island will allow. Most of the material was collected by the members of the Club in their free time, namely, during Sundays and other holidays and during visits in the evenings of week days, but it is fair to add that both the Bureau of Entomology and the National Museum freely granted short leaves of absence to their respective employees to continue investigation on that Island. The Coleoptera have been carefully named and listed by the Custodian, and it is the intention of the members of the Biologists' Field Club to publish shortly a full list of all the animals and plants hitherto found on that Island.

It may be added that the Hemiptera, Orthoptera, Neuroptera and Lepidoptera of this collection have also been determined and listed by the various specialists of the Bureau of Entomology attached to the Museum, the only parts that have not yet been worked up being the Hymenoptera and Diptera. The number of species in the Plummerts Island collection new to the Museum as well as new to science is astonishingly large, even the Coleoptera furnishing its quota of new and undescribed species. With the exception of the Lepidoptera the collection is still kept intact, and it is the intention to make it the foundation of a local collection illustrating the insect fauna of the vicinity of Washington, D. C. In the Coleoptera the number of species hitherto found on Plummerts Island is in the neighborhood of 1200 species.

The Barber collection from Brownsville, Texas. In view of the fact that the interesting region in southwestern Texas commonly called the Brownsville region, with its tropical fauna, was very little represented in the Museum collection, it has been very gratifying that Mr. H. S. Barber was sent by the Chief of the Bureau of Entomology to that region in the year 1904, under the auspices of the Carnegie fund, in order to make collections of mosquitoes and incidentally other insects. A large collection of insects of all orders, in excellent condition, was brought back by Mr. Barber, and has been mounted and labeled by him. The Coleoptera have been determined by the Custodian and a list made thereof, which probably will be published by the Brooklyn Institute of Arts and Sciences which also possesses a large collection of Brownsville Coleoptera. The number of species from Brownsville, Texas, new to our collection is surprisingly large, and it is estimated that of the total number of tropical genera and species that will ultimately be found in that region, about three-fourths are now represented at the Museum.

The Piper collection from Idaho and Washington. Professor C. V. Piper, while attached to the Agricultural Experiment Station in Idaho, made quite a collection of Coleoptera which he has kindly donated to the Museum. While not very rich in species new to the collection and not containing many small specimens, the collection is of great value on account of the locality, the fauna of the State of Idaho not previously having been well represented at the Museum.

The Keene collection from Queen Charlotte Islands, British Columbia. The Reverend Mr. Keene, who for a series of years was a missionary at Massett, Queen Charlotte Islands, donated the duplicates of his collection to the Bureau of Entomology and it was at once turned over to the Museum by the Chief of the Bureau. The collection contains a complete set of the

smaller Coleoptera found by Mr. Keene and of which he published a list in the Canadian Entomologist. The addition of the collection to the National Museum is of especial value from the fact that hitherto the Museum did not possess a single specimen from that locality. The collection consists exclusively of Coleoptera. It numbers about 4,000 specimens.

The Wickham collection of Rhyncophorus Coleoptera. This collection, made by Prof. H. F. Wickham, of Iowa City, in various parts of the United States but more especially in Iowa and in the southwestern States, was purchased by the Bureau of Entomology and turned over by Doctor Howard to the National Museum. It contains many thousand well preserved and well labeled specimens, and while the number of species new to the Museum is not very large, the collection is of great value on account of the large series of specimens illustrating very fully the geographical distribution of many species which in the Museum collection was not fully represented.

The Fresno collection, made by E. A. Schwarz. While on official duty at Fresno, California, in connection with the acclimatization of the fig insect, Mr. Schwarz made in 1900 incidentally quite a collection of insects of various orders, consisting mostly of Coleoptera and nocturnal Lepidoptera. From the fact that hitherto the Museum collection contained hardly any specimens from the San Joaquin Valley of California, this collection is of considerable interest although not a very large one.

The Key West, Florida, collection, made by Mr. E. A. Schwarz. On his return from Cuba, where he was sent by the Bureau of Entomology during the cotton boll weevil investigation, Mr. Schwarz stopped for a week at Key West in order to complete collections made by him many years ago. A large number of tropical Coleoptera not hitherto found in the Island was the result of this short stay, and it is now estimated that the tropical Coleoptera fauna of Florida represented in the Museum collection is by far the most complete one ever made in that region. A list of the strictly semi-tropical Coleoptera of southern Florida has been made by the Custodian and from this useful list it can be seen that not more than about ten species are missing in the collection. Whether we know now all the tropical insects occurring in Florida is a matter of doubt because a large proportion of the tropical region, namely, the west coast from Punta Gorda to Cape Sable and many of the Keys on the east coast as well as the largest part of the mainland from Biscayne Bay to Cape Sable have never been entomologically explored. It is estimated, however, that the total number of tropical Coleoptera in Florida does not exceed four hundred species.

Collections made in various parts of Texas by the members of the Bureau of Entomology employed in the cotton boll weevil investigation. From time to time larger and smaller sets of insects of various orders have been received from this source and turned over to the Museum by the Chief of the Bureau of Entomology. In the aggregate these specimens will number several thousand, and although the Texan fauna had been very well represented in the collection, the addition of new species received from this source is quite considerable, more especially from the collections made at Victoria, Texas. Most of the cotton boll weevil investigators in Texas did their best to make contributions to this collection.

Smaller or larger sets of Coleoptera are almost daily received for determination by Dr. L. O. Howard, partly in his capacity as Chief of the Bureau of Entomology, and partly as Honorary Curator of the Division of Insects, from numerous correspondents all over the country. The time required in the handling and determination of these sets is very great and perhaps not proportionate with the benefit derived from the increase of the collection. Still in the course of years the number of new species and rare specimens added to the Museum collection from this source is quite considerable.

The Custodian of Coleoptera is called upon to determine the Coleoptera found in the collection of bird stomachs made by the Bureau of Biological Survey of the Department of Agriculture, and while the insects thus found are mostly represented by fragments, here and there a well preserved specimen, being either new or rare, is found in the stomachs, and since large lots of these birds are shot in regions of the country which have not been visited by entomologists, the accession to the Museum derived from this peculiar source is of greater importance than we should expect. It is quite fair to state that the Chief of the Biological Survey always courteously allowed us to retain for the National Museum collection whatever of value has been found in the birds' stomachs.

A large number of exchanges were made in the course of time with most of the leading coleopterists of the country, and while the mechanical work connected with making exchanges, namely, the selecting of specimens desired by correspondents, the pinning and labeling, etc., requires an undue length of time, the result as a whole has been very satisfactory, and in the neighborhood of 200 species of North American Coleoptera have been thus added by exchange to the collection since the year 1897. The most important of these exchanges was that made with Mr. Charles Fuchs, of San Francisco, who sent to the Museum a large proportion of the Coleoptera described by the late Dr. George H. Horn from the Cape San Lucas region of Lower

California. Previous to this exchange the Museum collection did not contain more than three or four species from that region.

Finally additions of single specimens or small sets of specimens of Coleoptera are almost daily received from such of the employees of the Bureau of Entomology and National Museum who are enterprising and zealous enough to spend their free time in search of specimens. No particular accessions are made for such specimens, which in the aggregate constitute a valuable addition to the collection.

It is estimated that, when properly displayed, the collection of North American Coleoptera will require at least 500 museum drawers. At present only 80 of such drawers were available for this purpose and, as a consequence, by far the largest portion of this collection is still in the old Schmidt boxes, the constant handling of which is very detrimental to the condition of the specimens.

WEST INDIES.

Since the establishment of the government experiment station at Porto Rico, the need for a better knowledge of the West Indian Coleopterous fauna has been seriously felt. This the more so as in the old Museum collection there was not more than about thirty species of Coleoptera from that region. As a first step to remedy this state of affairs, the Custodian prepared a card catalogue of the Coleoptera described from the West Indies. This catalogue has since proven of the greatest assistance in the determination of many species of Coleoptera sent, partly by the experiment station in Porto Rico and especially by the newly established experiment station at Santiago de las Vegas, Cuba. What is more important, a working collection of Coleoptera from the West Indies has been formed at the Museum since the year 1897, and numbers now about three thousand species. The beginning of this collection dates back to the transfer of the Hubbard and Schwarz collection, which contained a fine series of Coleoptera collected by the late H. G. Hubbard in Jamaica and the Island of Montserrat, numbering to about three hundred species. With the acquisition of Porto Rico by the United States and the military occupation of Cuba, smaller sets of Coleoptera coming from these two islands and collected by various officials of the U. S. National Museum were added to the collection, but the West Indian collections made by the employees of the Bureau of Entomology of late years outrank in importance all the collections made previously. Thus Mr. August Busck, on two trips, one to Cuba and the other to Porto Rico, brought back important collections which were mounted and labeled by himself and turned over to the National Museum by the Chief of the Bureau

of Entomology. A still larger collection of West Indian Coleoptera was made by Mr. August Busck in Santo Domingo, Trinidad, and some of the lesser Antilles, in the course of the mosquito investigations carried on by Dr. L. O. Howard under a fund provided by the Carnegie Institute. A part of this large collection was mounted and labeled by Mr. Busck himself. The other part could not be mounted until quite recently for lack of working force. Quite recently, however, Doctor Howard detailed two expert preparators for the work, and the Busck collection is now rapidly being mounted and rendered available for study.

The most important addition to the Cuban fauna of Coleoptera was acquired through the Cotton boll weevil investigation, Mr. E. A. Schwarz being sent by the Bureau of Entomology to Cayamas, Province of Santa Clara, Cuba, for the purpose of investigating the cotton boll weevil. Mr. Schwarz incidentally made a large collection of Coleoptera at that point amounting to about fifteen hundred species. This collection was mounted and labeled by the Custodian, and the whole of the West Indian material which has accumulated has been determined and arranged by him. The collection thus formed has been of the greatest assistance in the determination of insects sent on by the Agricultural Experiment Stations of Cuba and Porto Rico, and the accessions derived from the lot of insects sent from this source have been quite considerable. Prof. Carl F. Baker, the Botanist of the experiment station at Santiago de las Vegas, especially sent on large sets of Coleoptera from his private collection for determination and with permission to retain everything for the National Museum. The British agricultural experiment stations at Jamaica and Santa Lucia are also sending on Coleoptera for determination which is constantly increasing the collection at the Museum.

At present the West Indian collection is contained in twenty of the regular Museum cases. These have become so crowded that a re-arrangement of the collection in the near future will be absolutely necessary. As a matter of course among the smaller species there are a great many undescribed ones, and the collection will one day be able to furnish most valuable material to any competent Coleopterist who desires to work up the West Indian Coleopterous fauna.

CENTRAL AMERICA.

The old collection consisted of a series of species donated to the Museum by the Government of Mexico, and which was on exhibition at the Chicago Exposition. There were not more than about three hundred species. Since the year 1897 additional species from Mexico were sent from time to time for

determination by Mr. O. W. Barrett who was in charge of the entomological portion of the National Museum in Mexico.

More important additions were made by various employes of the Bureau of Entomology of the U. S. Department of Agriculture from various parts of Mexico, namely, by Prof. Herbert Osborn, Mr. Albert Koebele, and Dr. L. O. Howard, Chief of the Bureau.

Of late years Prof. A. L. Herrera is sending in for determination to the Bureau of Entomology species of economic importance, which all help to increase the collection from Mexico. A small but valuable set of species from Cuernavaca was donated by Mr. Wm. Schaus.

A valuable set of species from the territory of Tepic in the Mexican State of Sinaloa, collected by Doctor Gustav Eisen, was secured in exchange with the California Academy of Sciences through Mr. Chas. Fuchs.

As to the Central American states south of Mexico, the Museum had absolutely nothing until some years ago the Schildborgdorf collection from Costa Rica was purchased by the Museum. This collection contains about fifteen hundred species, all of them representing Coleoptera of larger size, but all new to the Museum collection.

The greatest increase to the Central American collection is of quite recent date, and consists of the following two collections: that made by Mr. Frederick Knab in 1905, mainly at various points on the west coast of Central America, on an expedition undertaken for the purpose of collecting mosquitoes under the auspices and at the expense of the Carnegie Institution; the other collection being that made the present year by Messrs. Barber and Schwarz in the eastern part of Guatemala, the expenses of the expedition being paid by the Bureau of Entomology from the cotton boll weevil fund. These two collections are just being mounted and labeled, and it is estimated that they will contain more than 2,500 species of Coleoptera new to the Museum collections.

Only forty drawers are available for the Central American collection, and it is certain, therefore, that only a small portion of the collection can be arranged unless more drawers are furnished by the Museum. As it is now, the collection is in tolerably good working order as far as the larger specimens are concerned, and by its aid specimens of most families sent in by correspondents can be determined.

HAWAIIAN ISLANDS.

For practical reasons it has been found necessary to keep the material from the Hawaiian Islands separate. The foundation of this collection is a set of species (about 150 species) which

came to the Museum with the purchase by the U. S. Department of Agriculture of the Belfrage collection. Since that time it has been largely increased by a collection made by Dr. Wm. H. Ashmead on a trip to the islands at the expense of the U. S. National Museum; and further by various sendings of species, mostly of economic interest, made by the experiment station at Honolulu to the Bureau of Entomology. On the whole, this collection is still very small when compared with the number of Coleoptera collected on the islands by Mr. Perkins under the auspices of a committee of the Royal Zoological Society in England.

There are no drawers available for the proper arrangement of this collection, which has to be kept in Schmidt boxes in a very crowded condition, but all the species have been properly named.

SOUTH AMERICA.

This collection is still in very unsatisfactory condition, not only on account of the scanty material hitherto at the Museum, but also from the fact that from lack of space the material can not be spread out and thus rendered available for study and determination.

Of the old material the most valuable part is a set of Brazilian Scarabaeidae and Cerambycidae purchased by the Museum from the well-known collector, Mr. H. H. Smith, at the occasion of the Chicago Exposition in 1893. The accessions made since that time are but few, the most important being the following:

A considerable number of Brazilian Coleoptera collected by Mr. Albert Koebele at Pernambuco and Bahia during a trip undertaken many years ago at the expense of the Department of Agriculture during the cotton worm investigation. This collection was kept at the Department of Agriculture for many years until, on account of the crowded condition at the Bureau of Entomology, it was turned over to the National Museum.

Secondly, a collection of Chilean insects, which was sent by the Chilean Government to the Exposition at Buffalo in 1903, where, however, it was never unpacked and was misplaced. Through the intercession of the Chief of the Bureau of Entomology, the collection was finally recovered in 1904 and donated by the Chilean Government to the Bureau of Entomology from which it has been transferred by the Chief of the Bureau to the National Museum. The collection, containing about five hundred species, has suffered somewhat from dust, but is otherwise in good condition. The species were most of them named by Mr. Reed, who is in charge of the public insect collection at Santiago, Chile.

Valuable Venezuelan Coleoptera were donated to the Museum from time to time by Mr. Edward E. Klages. There is further some hope that a large collection of Coleoptera from the La Plata states may be purchased by the Bureau of Entomology.

EUROPE.

The old collection of European Coleoptera, consisting of those species which were in the Riley collection and those in the collections made by Dr. John B. Smith and M. L. Linell, has received hardly any additions except through exchanges with some European entomologists. These exchanges have not been sufficiently large to make this collection a really valuable one. A full collection of European Coleoptera is most desirable for the Museum, in order to make comparison with the North American fauna, but without purchasing large and well-determined collections in Europe it can not be hoped to bring together by casual exchange a collection of European insects of any great scientific value.

The European collection of the Museum contains about 4,000 species and is still kept in a very crowded condition in old Schmidt boxes. No regular Museum drawers are available to display the collection to better advantage.

AFRICA.

The old Museum collection of African Coleoptera has practically received only one important addition, namely, the collection made by Messrs. O. F. Cook and R. P. Currie in Liberia. This collection was mounted and labeled by Mr. Currie and partially determined by the present Custodian. Other additions of smaller extent came with the donation of the Hubbard and Schwarz collection which contained a small set of micro-Coleoptera from the Cape region, and from various other donations. On the whole, the African collection is in a very unsatisfactory condition, and the material can not be spread out and rendered available for study for want of space and drawers.

ASIA.

Of the North Asiatic fauna, the Museum has practically nothing in Coleoptera excepting a few small but valuable collections made by Dr. Leonhard Stejneger during the international fur-seal investigation on the Commander Islands, on Behring Island, and in parts of Kamchatka. These sets, which are still kept separate, were determined by the Custodian, and lists furnished to Doctor Stejneger, but it appears that the lists have never been published. A few small sets of Coleoptera from northern China, received as donations by correspondents

of the Museum, complete the small representation of the Coleopterous fauna of northern Asia.

From tropical Asia the only accessions of any value were through exchange with Mr. G. van Roon, of Rotterdam, Holland, and a set of Indian and Siamese Coleoptera collected by Mr. Fruhstorfer purchased and donated to the Museum by the Custodian.

The Japanese collection is gradually getting increased through the sendings for determination from Professor Nava, of Gifu, and other Japanese correspondents of the Bureau of Entomology. All Japanese insects received from this source have been properly remounted, but the original locality labels, being written in Japanese characters, are of little value. The Japanese collection is tolerably well displayed, but is still kept in the old Schmidt boxes.

It is to be greatly regretted that the Museum collection of the Philippine Islands is still in such fragmentary condition as to be practically without value for determination of Coleoptera, and what little material is at the Museum can not be spread out on account of want of space. The largest collections of Philippine Island Coleoptera were made during the first years of the military occupation by the United States, by the hospital stewards, P. Stangl and A. P. Ashly, and donated to the Museum. Another valuable set from Mindanao was donated to the Museum by Mr. E. A. Mearns. Mr. Charles S. Banks, who is Entomologist of the Bureau of Science, Department of Interior, at Manila, has sent on from time to time for determination small sets of specimens, but in the present state of our collection only a few species can be named. A set of Luzon insects made by Mr. J. L. Webb, of the Bureau of Entomology, while in the service of the Philippine forestry department, was finally secured for the Museum. This collection was unfortunately kept at Manila for about two years, and has suffered greatly from mold. The Philippine Island collection is still kept mostly unarranged in Schmidt boxes, and in the present condition of the Museum there is no chance of spreading it out or to make a serious attempt to determine the species.

From the Malayan Archipelago material of considerable value has been received, but most of it undetermined. Prof. D. G. Fairchild, of the Bureau of Plant Industry, U. S. Department of Agriculture, has donated collections of considerable extent, made by him on the islands of Java and Ceram. Another very valuable collection from Mt. Kina Balu, North Borneo, was donated to the Museum by Messrs. A. D. Dodge and A. G. Goss. This collection includes a full set of the Theodosia beetles which are peculiar to the mountain just mentioned.

This collection from the Malay Archipelago, at present still unarranged, will ultimately be incorporated into the Asiatic collection—as soon as time and space will permit.

AUSTRALIA.

The few Australian Coleoptera in the old Museum collection have received but one important addition, namely, the collection of Coccinellidae, made by Mr. Albert Koebele during his several trips to Australia undertaken partly at the expense of the Bureau of Entomology and partly at the expense of the State Board of Horticulture of California, for the purpose of introducing scale-feeding Coccinellidae into California. These Coccinellidae were partly determined by Mr. Blackburn, of Australia, and partly by the Custodian, and it is advisable to keep these Coccinellidae separate from the rest of the Australian collection to facilitate their recognition when they occur in other countries.

The New Zealand collection has been largely increased by a finely mounted and well determined set of species collected and determined by Captain Broun, the well-known authority on New Zealand Coleoptera. This set came to the Museum through the collection of Messrs. Hubbard and Schwarz, who received the specimens, through exchange, from Captain Broun.

BIOLOGIC COLLECTION.

The old collection of Coleoptera larvae was that made by the late Dr. C. V. Riley and that accumulated at the Division of Entomology, U. S. Department of Agriculture. This collection was the least important part of the biologic collections accumulated during many years by the Department of Agriculture, and unfortunately had been displayed in a way which seriously injured the specimens from the fact that the small vials were kept in a horizontal position, and in spite of the fact that every year the laborious work of refilling the vials was undertaken, a goodly proportion of the specimens have dried up. An important addition to this collection was the biologic material contained in the Hubbard and Schwarz collection. This collection is kept in vials held in vertical position in trays, and it has been found that an alcoholic collection kept in this way does not need any refilling for many years. The additions to the biologic collections are, therefore, kept in the same way.

Naturally the collection of biologic material is of slow growth, and the additions received from various sources are of small extent.

Since none of the other Custodians of the Division of Insects possess alcoholic collections, the alcoholic material of the Hubbard and Schwarz collection which represent not only Coleoptera but other orders is kept together, and occupies one of the regular Museum cases, the shelves of which have been increased to the largest possible number.

The only drawback to the arrangement of this collection in trays is the unequal size of the vials, which is necessitated by the unequal size of the specimens, and thus for larger specimens vials and trays of a larger size must be used and kept separate from those of the smaller specimens. The biologic collection contains but little exotic material.

MICROSCOPIC COLLECTION.

Upon entering his office, the present Custodian found only a small and quite worthless collection of slides representing miscellaneous European Coleoptera and a small number of slides prepared by Dr. J. B. Smith, illustrating various structures of North American beetles. A valuable addition to the collection came to the Museum through the donation of the Hubbard and Schwarz collection, which contained a number of slides made from North American Coleoptera. By far the largest and most valuable addition to the slide collection has been made, and is being made, in recent years through the zeal and skill of Mr. H. S. Barber, Aid to the Division of Entomology, who also arranged the slides in a case and prepared a catalogue of them. Proper labels put in the systematic collection facilitate the use of the microscopical collection.

At present, most of the slides represent structural details of North American Coleoptera.

A RESUMÉ OF THE WORKS OF JACOB HÜBNER IN REGARD TO THE NOMENCLATURE EMPLOYED THEREIN.

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In the *Sammlung Europaischer Schmetterlinge*, published in the latter part of the eighteenth and the beginning of the nineteenth centuries, Hübner used the Linnaean genera *Papilio* and *Sphinx*, and the subgenera (?) *Bombyx*, *Noctua*, *Geometra*, *Pyrallis*, *Tortrix*, *Alucita*.

In the early part of the nineteenth century, probably late in the year 1805 or before November 15, 1806, although possibly of somewhat later date up to the year 1810, Hübner printed a two page tract known as the *Tentamen*.

This divides the order Lepidoptera into nine Phalanges, these being the well-known generic and subgeneric (?) names of

Linnaeus. Attention has been called, by prior authors, to the fact that these Phalanges are printed in the plural, but a glance into the works of Linnaeus shows that he also used all of these names in the plural when he wished to indicate that more than a single species was under consideration. In this respect, therefore, the Tentamen does not differ radically from the *Systema Naturae*.¹

Each Tentamen Phalanx is divided into tribes which are indicative of groups of common structural characters, but the "names" given to the tribes are the only "names" employed in the Tentamen not starting with capital letters and printed in italic type, and since they are in adjective form, are undoubtedly intended as descriptions rather than true names. As an example Sphinges (i. e. *Sphinx* L.) is divided into three tribes,—

"*Tribus I; papilionoides.*" (viz, the butterfly-like Sphingids, rather broad winged and diurnal.)

"*Tribus II; hymenopteroides.*" (viz, the Hymenoptera-like, i. e., wasp-like, Sphingids; greatly resembling wasps and by most authors considered mimics thereof.)

"*Tribus III; legitimae.*" (viz, the legitimate or real Sphingids, true members of the present Sphingidae sorted out of the heterogenous genus *Sphinx* of Linnaeus.)

Each "tribus" is divided into a number of stirpes; each stirpe name given both in the plural and—combined with a specific name—in the singular;—examples,

"I. Nerëides—Nerëis Polymnia."

"II. Limnades—Limnas Chrysippus."

Hübner printed one hundred and seven such combinations in the Tentamen, each specific name traceable because of the quotation of the prior generic (or subgeneric) name, the whole scheme much simplified because of the descriptive characterization of the tribes corresponding to a determination "key." *Sphecomorpha*, if generic, must take as type *Sphinx incendiaria* (stated to be a wasp-like Sphingid) as sole species. As each stirps name, like *Sphecomorpha*, is in the nominative, singular, Latinized, and the first part of a binomial, then, from the standpoint of the Tentamen, 1806, they would appear to agree with all definitions of generic names.

If, however, other literature is to be taken into consideration, then the obvious course is to determine the relation between such names as *Sphecomorpha* (if generic the wasp-like *Sphinx incendiaria* sole species and therefore type), and prior literature. While *Sphecomorpha* may be determined as a new name, *Zygaena* can easily be found as having been published as a genus about

¹Linnaeus used plurals in other orders—*Bos* vs. *Bovæ*, etc.

thirty-one years prior to the Tentamen. So can *Sesia*. *Pterophora* is obviously merely an emendation of *Pterophorus* Fabr., so that the original orthography of *Alucita pentadactyla* L. need not be changed to *pentadactylus*, as was done by Fabricius. *Thyris* is not new, being first printed by Laspeyres, in Illiger, Mag. Ins., II, 39 (1803). *Hepiolus* is *Hepialus* Fabr., first emended by Illiger (Mag. Ins., I, 138 (1802)), the corrected form adopted not only by Hübner, but by Ochsenheimer (Schmett. Europ., III, 103 (1810)). This case is of some interest as indicative that Hübner both knew and followed the literature of his day.

Therefore, it is to be seen, from a study of the Tentamen names on the basis of 1806 and prior dates, that Hübner elevated and divided the Linnaean genera (or in the case of the genus *Phalena*, the large subgenera) into a series of stirpes, which have the same rank as the smaller genera of the later works of Fabricius, and of other authors of the same period.

The Sammlung exotischer Schmetterlinge presumably followed closely the Tentamen, plates I, II, V-VIII, XII, XV, XXIX, XLVII being issued before November 15, 1806 (according to Fernald, 1905).

The work was issued mainly in the form of plates appearing at different dates. The first two hundred and thirteen plates bear a nomenclature usually termed "trinomial." This seems largely due to the influence of the so-called "fac-simile" edition of Wytzman. In the original copies, the stirps name is printed in the same type as the specific name, both starting with capital letters, while between these two names a word descriptive of a mere group assigned to the stirps has been intercalated in italic and smaller type starting with a small letter. Examples: plate I, *Nerëis vitrea* *Doto* (the following five plates containing *Nerëis vitrea* sps.); plate VII, *Nerëis fulva* *Polymnia* (the two following plates containing *Nerëis fulva* sps.); plate X, *Nerëis festiva* *Thales* (the three following plates containing *Nerëis festiva* sps.); plate XIV, *Nerëis fulva* *Calliope* (will be noted as being out of place if the word *fulva* has a nomenclatorial status); plate XV, *Nerëis carulea* *Thamar*; plate XVI, *Nerëis carulea* *Sara*; plate XVII, *Nerëis viridis* *Dido*. In other words, Hübner's original plates show that the binomial is the stirps name plus the specific name, with the intercalation of a word indicative of coloration or some similar character considered in 1806 to be of minor importance; viz, the vitreous *Nerëis* sps., the fulvous *Nerëis* sps., the brightly-colored *Nerëis* sps., the green *Nerëis* sps., etc.

The so-called "fac-simile" copies have printed the names erroneously, *Nerëis* being in smaller and less heavy type than

"*Vitrea Doto*," while *vitrea* is started with a capital letter, causing what appears to be either a trinomial nomenclature or a binomial *Vitrea Doto* with the stirps name (*Nerëis*) indicating some category higher than generic.

Whether Hübner changed his system or not after plate CCXIII is a question which can scarcely be solved from a study of the Sammlung alone. He no longer used the stirps names in the singular as part of a binomial combination, nor do the "names" like *fulva* appear except as *Fulvæ*, but instead the binomial appears to represent the coitus of the Verzeichniss plus the specific name;—example, *Junonia Coenia*.

The Verzeichniss bekannter Schmetterlinge is a synonymic and bibliographical catalogue. Probably the first pages of this work (presumably distributed a few pages at a time) were ready for distribution in about the year 1816, although there remains some question as to the exact dates of availability.

On page 3 Hübner states he made known his Tentamen as a basis of his work. On page 7 his "Phalanx I" bears the same name, "Papiliones" used in the Tentamen (with the synonymy listed by Hübner "Papiliones Linn. Papiliones & Hesperiae Fabr.") Here also appears the Tentamen "Stirps I Nerëides" (with synonymy "Heliconii Linn. & Fabr."), followed by a characterization of the name, said name appearing to be in the plural because of reference to more than a single included species (following the examples of Linnaeus, etc.). It is in the singular in the Anzeiger of the Verzeichniss in several places where uncombined with more than a single other name. Following "Stirps I" is "Familia A," "Vitreae," but this is also in the singular in the Anzeiger, "Vitrea 8. Nerëis." The characters given on page 8 indicate that *Vitrea* is a mere group of *Nerëis*, based upon vitreous wings, as might also be deduced from the method employed in listing the "Familia" names in the Anzeiger, and their prior application in the Sammlung. Toward the bottom of page 8 appears "Coitus I," "Hymenites" (note the plural usage because of more than a single species being under consideration). Then appear specific names like "*Hymenitis Diaphane*" (note the singular use of *Hymenitis* because of the single species *diaphane*).

From the evidence furnished by the structure of the Verzeichniss and its Anzeiger, it would appear that Hübner elevated to Phalanges, the larger genera of the older authors, and then subdivided them into a set of tribes descriptive of great groups, being approximately equivalent to our present smaller families and larger subfamilies. That he further subdivided into a set of stirpes corresponding taxonomically in the main to the subgeneric (?) names of Linnaeus which Fabricius used as genera, i. e., *Heliconius*, *Festivus*, *Ruralis*, etc. In other words,

that his term "stirps" of the Verzeichniss seems about equal taxonomically to the smaller genera of the latter works of Fabricius. The nomenclatorial evidence that the stirpes of the Verzeichniss are the true genera is more elusive consisting mainly of the facts:—

1. They are usually described on structural characters, whereas any name assigned to the rank of "Familia" or "Coitus" is usually described upon minor superficial characters.

2. That they appear in the nominative singular in the Anzeiger, while in the text the "Coitus" name is also in the plural when combined with more than a single species.

3. That specific homonyms are sunk when appearing within the same stirps, and a new specific name proposed. Example: page 74, *gryneus* is a new name for *damon* Cram. nec *damon* Schiff. (page 67) although the quadriminials assigned to the names, if placed in the singular following the Anzeiger, would read *Agrodiaetus Adolescens Nomiades Damon* Schiff. and *Agrodiaetus Armatus Lycus Gryneus (Damon* Cram.).¹

4. That certain plates of the Sammlung bearing numbers lower than CCXIII are not listed in the Verzeichniss, indicative, with other substantiating evidence, that they appeared subsequently to at least the writing of the manuscript and probably to the publication of that part of the Verzeichniss containing their stirpes names, and that notwithstanding that the so-called "binomial" Verzeichniss was using the "coitus" name as the first part of the "binomial," these Sammlung plates possess the same type of nomenclature as plates issued before publication of any of the sheets of the Verzeichniss; example: *Limnas thalassica* *Limniace*. Whereas, other Sammlung plates issued either prior to the writing or publication of that part of the Verzeichniss containing their stirpes are listed in the bibliography as: example, Verz., p. 9, "I. Doto Hübner. Ner. vitr. Doto" (being Sammlung plate I). It will thus be seen that Hübner's plates of the Sammlung formerly said to be "trinomial," but which we have shown to be in reality binomial, overlapped with the so-called "binomial" Verzeichniss.

5. Little is to be gained by a study of the terms employed by Hübner in his Verzeichniss, where species are called "genera." Viewed from one angle his "Coitus" might appear generic because of the German "Verein." But, from the standpoint of Latin, "genus" might well be translated species or kind; "coitus," as a mere assembling; "familia," as a part of a gens, viz.

¹While Hübner did not give the same name to any two stirpes, and renamed specific homonyms, he was not so careful regarding his coitus names. At least one name (*Epia*) has been used in the Verzeichniss for two distinct coiti, rather indicative that its author considered the "coitus" names of less importance than either the "stirps" or the "genera" (species) names.

of a single descendant; "stirps," as the lower part of the trunk of plants, or as a plant, shrub, stem, or stock, but conveying the meaning like English scion of offspring, progeny; "tribus," as a tribe or division of the people; "phalanx," as a host drawn up in close order. We rather wonder if Hübner could possibly have had some hazy idea of evolution in mind? His Latin terms would almost seem to indicate this.

While these terms and their translations are interesting, to our minds they show no conclusive evidence as to the nomenclatorial status of the names. "Verein," and hence "Coitus," might be translated to "genus," though in Hübner the term "genus" is used to indicate species, quite contrary to former usage. Furthermore, while the term "Stirps" was perhaps used by certain of the older authors to indicate a group higher than a genus, it was also used in the generic sense; while the term "Familia" was used as a subdivision of a genus, just as we think Hübner intended it; and Linnaeus used the term "Phalanx" to indicate a group smaller than a genus, viz, "*Papiliones dividuntur in VI phalanges: a. Equites Alis primoribus ab . . .*"

6. In attempting to determine the meaning of the terms of Hübner, rather than a mere translation of the term words, we find the system employed in the Verzeichniss directly comparable to that employed by Linnaeus. Compare, *Papilio* (or *Papiliones*) *Equites* (as *Eques* when a single species is to be considered) *Troës* (which we do not find in Linnaeus, 1758, in the singular) *Priamus*, with *Nerëides* (singular *Nerëis* given in Anzeiger) *Vitreæ* (singular *Vitreæ* listed in Anzeiger "Vitreæ 8. Nerëis") *Hymenites* (singular *Hymenitis* in text when with but a single species) *Diaphane*; these two "quadrinomials" being respectively the first species of the *Systema Naturæ* and the Verzeichniss.

The *Zuträge zur Sammlung exotischer Schmettlinge*, in the original copies, consists of plates and text, the plates without names, but their figures numbered, and these numbers appearing both in the descriptive text and on other sheets in tabular form. Exact dates of availability of the various names are much in dispute. The "binomial" consists of the coitus plus the specific name, but in the text appears the stirps and familia name for each species, while there are also lists of the stirps names in the nominative singular. Thus while *Rusticus* of the Tentamen has been abandoned both in the Verzeichniss and the *Zuträge* for *Agrodiaetus* (or *Agrodiaeti*), the nominative singular form appears in places in both works.

An interesting point about the *Zuträge* is that in his description of new species Hübner usually calls attention to differences from known species. In those cases where he compares with

a Linnaean species he lists the full Linnaean "quadrinomial." This to our mind is quite important as a bit of evidence tending to show that Hübner recognized the Linnaean species as "quadrinomial" rather than "binomial." Hübner was not the only Lepidopterist to use Linnaean "quadrinomials." Cramer and Stoll are other well-known authors¹ who follow identically the Linnaean system. Compare, 1791, "Pap. Eq. Troes EPHESTION" Stoll, with "P. E. T. Priamus" L. (1758). An English author, Drury, as late as 1782, used "P. Eq. Tro." as "genus" for his new species "Antimachus." So that to within fifteen years or less of the dates of issue of the Tentamen and the first plates of the Sammlung, Hübner had abundant precedence for the establishment of a "quadrinomial" nomenclature which in reality is a binomial nomenclature with the second and third names added to split the large genera into groups.

In conclusion, we are forced to the belief that the "Stirps" of Hübner, at least between dates 1806 to 1816-18, is of the same nomenclatorial rank as the three genera, *Papilio*, *Sphinx*, and *Phalæna* of Linnaeus, 1758; and that about 1816-1818 he intercalated his "coitus," which while certainly comparable with "Troës," etc., of Linnaeus, differs in that it has been used in the nominative singular as part of the Verzeichniss "binomial," and would, therefore, appear available as generic in as much as it violates no characterization of a "subgeneric" name.

We are surprised to learn that while Sir George Hampson did not adopt the Tentamen, he did have much the same viewpoint regarding the rank of the Hübnerian terms. After about sixty years of the most intensive revisional work he wrote (1917, Ent. News, XXVIII, 465): "The real genera for which structural characters are given in the Verzeichniss are the Stirpes and Hübner's lower divisions Familiae and Coitus are mere form and color sections and so considered by Hübner himself, and should not, strictly speaking, be treated as generic names. In fact, Hübner's nomenclature, as also that of Linné, is only called binomial by a time-honored fiction. It is instructive to note that many of the older authors used the term Family as a subdivision of genus, as indeed is its proper meaning."

¹For similar "quadrinomial" nomenclature in Lepidoptera consult the works of Fabricius, Sulzer, Knoch, Barbut, Esper, Borkhausen, and in part Geoffroy, Latreille (in Lamarck, 1801), Abbot & Smith, etc.

REMARKS ON THE NAME OF ONE OF OUR COMMON
YELLOW-JACKETS.

BY S. A. ROHWER, U. S. Bureau of Entomology.

As early as 1785 the specific name *communis* was used for a species of the genus *Vespa*, yet in 1857 Saussure again used this name for another species, this time applying it to one of the commonest "yellow-jackets" or "hornets" in Eastern North America. Schrank (Neu. Magaz. Liebh. Entom., vol. 2, 1785, p. 328) was the first author to use the name *communis* in the genus *Vespa*, and at this time selected it for an European species from Batavia. Subsequent to the original publication Schrank (Fauna Boica, vol. 2 (2), 1802, p. 351) and C. Huber (Vollst. Naturg. d. Bau. u. Baumhölzer, vol. 2, (6), 1807, p. 302) treated this European species, but since then it has been so little understood that it is doubtfully placed in the genus *Vespa*. R. du Buysson in his monograph of the genus *Vespa* (Ann. Soc. Ent. France, vol. 73, 1904) omits all reference to Schrank's *communis* and treats only the Nearctic species described by Saussure. Dalla Torre in his Catalogus Hymenopterum (vol. 9, 1894, p. 141) gives both names, and quite contrary to his usual practice, does not propose a new name for the homonym. Again in 1904 Dalla Torre (Gen. Insectorum, fasc. 19, pp. 64 and 66) permits both names in the genus *Vespa*, but this time places the *communis* of Schrank in the genus with doubt. An examination of the description of *Vespa communis* Schrank leaves some doubt as to present systematic position of Schrank's species, but it certainly does not change the fact that *Vespa communis* Saussure is a homonym and as such should have a different name.

In his revision of the species of the genus *Vespa* R. du Buysson redescribed *communis* Saussure in all castes and in his record of material records specimens in the British Museum from Wilmington, Delaware, which bear the manuscript name label "*V. maculifrons* H." The publishing of this manuscript name in connection with this description validates the name *maculifrons* and makes it a synonym of du Buysson's interpretation of *communis* Saussure.

In tabulating the Canadian species of the genus *Vespa* Sladen (Ottawa Naturalist, vol. 32, 1918, pp. 71-72) divides *communis* into two varieties. The darker northern form he considers typical *communis*, while the paler southern form is considered as a new variety, for which he proposes the name *flavida*. These two varieties are separated on minor color differences in the female and it is doubtful if they will prove sufficiently distinct to justify names, but even if they do it seems that the restriction of the name *communis* to the darker northern variety is erroneous. This is supported by Saussure's original description and du Buysson's account which is

based partly on an examination of cotypes. If these are two varieties it is the darker northern form which would need a different name.

Dr. Bequaert has suggested (in litt. Dec. 2, 1925) that the form described by Shipp as *Vespa westwoodii* (Psyche, vol. 6, 1893, p. 450) is the same as *communis* Saussure. This may be correct, but Shipp's description is based on a discolored specimen and is so inadequate that I can not satisfactorily associate his form with any following three species as defined in du Buysson's revision: *germanica* Fabricius, *communis* Saussure or *vulgaris* Linnaeus. Assuming certain characters Shipp's description seems to agree rather satisfactorily with Sladen's darker northern form treated as *communis* var. *communis*. If this assumption is correct then the proper name of this common yellow-jacket would be *westwoodii*. Shipp's description of *westwoodii* calls for the following color markings which do not agree with the material of *maculifrons* before me: (1) supra-clypeal spot apparently well separated from the marks in the emargination of the eye; (2) markings of the posterior orbits interrupted and forming two spots; (3) first tergite apparently without yellow just before the anterior declivity; (4) tibia "with a black patch in the center of the inner margin." With these apparent minor differences, it seems advisable to refrain from expressing a definite opinion on the form described as *westwoodii* until the type, which is in the Oxford Museum, can be studied.

The following bibliography summarizes the above discussion and gives the more important taxonomic references to this common yellow-jacket.

Vespula (Vespula) maculifrons (R. du Buysson).

? *Vespa westwoodii* SHIPP, Psyche, vol. 6, 1893, p. 450.

Vespa communis SAUSSURE, Settin. Ent. Zeit., vol. 18, 1857, p. 117 (not Schrank, Neu. Magaz. Lieb. Entom., vol. 2, 1785, p. 328); R. DU BUYSSON, Ann. Soc. Ent. France, vol. 73, 1904, p. 606; SLADEN, Ottawa Naturalist, vol. 32, 1918, p. 71.

Vespa maculifrons R. DU BUYSSON, Ann. Soc. Ent. France, vol. 73, 1904, p. 608. (Cited as a collection manuscript name for specimens from Wilmington, Delaware, in connection with du Buysson's redescription of *communis* Saussure.)

Vespa germanica Fabricius, LEWIS, Trans. Amer. Ent. Soc., vol. 24, 1897, p. 177; MARLATT, Proc. Ent. Soc. Wash., vol. 2, 1891, p. 80-83. (Last reference based on a misidentification as evidenced by specimens in U. S. National Museum.)

Vespa communis var. *flavida* SLADEN, Ottawa Naturalist, vol. 32, 1918, p. 71. (Sladen gives this as a new name for *pennsylvanica* of Authors, but I am uncertain to which authors he refers—certainly not to Saussure or du Buysson.)

Vespula (Vespula) maculifrons, variety?

? *Vespa westwoodii* SHIPP, Psyche, vol. 6, 1893, p. 450.

Vespa communis var. *communis* SLADEN, Ottawa Naturalist, vol. 32, 1918, p. 71.

Actual date of publication, April 21, 1926.

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A NEW SPECIES OF STONE CRICKET FROM ARKANSAS
(ORTHOPTERA: TETTIGONIDAE; RHAPHIDOPHORINAE).

BY A. N. CAUDELL, *U. S. Bureau of Entomology.*

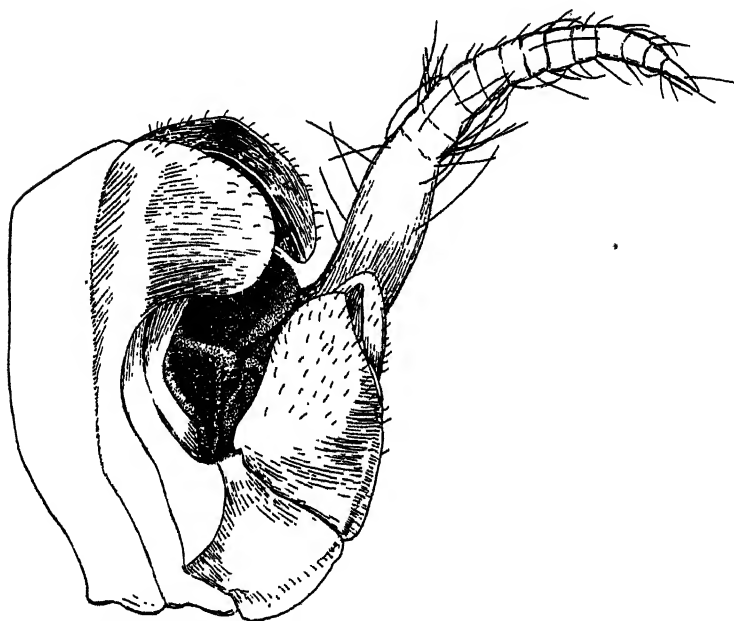
Ceuthophilus marshalli, new species.

Male.—Head yellow, smooth, the vertex very slightly tuberculously swollen; eyes black, small, about as long as broad, pointed below. Thorax smooth, yellow, with each section darker posteriorly; pronotum about as long as the meso- and metanotum together. Legs uniformly yellow, moderately slender; anterior femora a little longer than the pronotum, armed beneath on the anterior margin at about the apical fifth with a single large articulate spine; middle femora armed ventrally with three spines on the anterior margin, the largest situated about as the one on the fore femora, the other two smaller, the basal one situated a little beyond the middle, and on the posterior margin with one rather large genicular spine and one to three very small spines situated about as those on the outer margin;¹ posterior femora three times as long as the greatest width and tapering almost to the tip; ventral margins armed with short triangular teeth, those on the outer margin closer together, over thirty in number and extending to within about a fifth of the base, those of the inner margin smaller, about the same in number, situated a little further apart and extending to within a very short distance of the base; dorsal surface of these femora finely granulate, without acute points, or with one or two very minute ones; central sulcus broad for its entire length, narrowing slightly basally; anterior tibiae a little shorter than their corresponding femora, armed dorsally with sharp genicular spine on each side and beneath with three small spines on the anterior margin and two on the opposite margin, in addition to the larger apical pair; median tibiae about as long as their femora and armed as in the anterior ones with an additional pair of dorsal spines situated slightly distad of the middle; posterior tibiae subequal in length with their femora, straight, armed beneath with a pair of very minute apical spines and a subapical one situated on the median line, above with four pairs of spines, scarcely divergent, slightly slanting backwards, but little longer than

¹In the ♂ holotype there is but one of these small spines on the left femur, situated about the middle, and two on the right femur, situated approximately opposite the one on the left side; in the adult ♂ paratype there are two on one femur and none on the other, and the allotype has this margin wholly unarmed except for the genicular spine; thus it appears rather certain that these spines when present will vary in number from one to three.

the tibial width and situated almost opposite each other and each pair separated by subequal distances, the basal pair slightly beyond the basal fifth and the apical pair at the apical fifth; in addition to the above noted spines there are the usual apical calcars, three on each side, the dorsal pair of about the same length as the adjacent pair of dorsal spines and indistinguishable from them in form; the median pair about twice as long as the upper, the inner one slightly the longer and about three fourths as long as the posterior metatarsus; the ventral calcars slightly shorter than the dorsal ones. Anterior and middle tarsi a little shorter than their tibiae and the posterior ones about one half as long as their corresponding tibiae; posterior metatarsus subequal in length with the other three combined; second segment distinctly, but less than twice, longer than deep, and fully twice as long as the third segment.

Abdomen brownish yellow, paler beneath, moderately tapering and with the dorsal surface smooth; eighth dorsal segment apically transverse, similar to the preceding one; ninth dorsal segment projecting conspicuously beyond the eighth and apically deeply notched, the lateral angles assuming a vertical position from a lateral view appearing as in Fig. Supraanal plate almost hidden in the holotype but in the ♂ paratype it is seen to be triangular and a little longer than broad; subgenital plate apically triangularly notched, the notch apically occupying the greater part of the width of the plate; cerci simple, slender, thickest part a little basad of the middle, the length about the same as the greatest width of the posterior femora.



Ceuthophilus marshalli, end of female abdomen with one cercus removed.

Female.—Coloration and structure as in the male except in the following features: The median femora are unarmed on the posterior ventral margin except for the genicular spine, though in some specimens this margin will very surely be found armed with from one to three small spinules as in the male; posterior femora armed beneath on both margins in a little more than the apical half with many very minute teeth, more numerous on the outer margin; middle tibiae with two medio-dorsal spines on the right tibia and one on the anterior margin only of the other one; ninth segment of abdomen inconspicuous, almost hidden beneath the eighth. Subgenital plate apically rounded or, in dried specimens, mesially broadly notched; ovipositor noticeably longer than the pronotum, the outer valves smooth and apically curved upwards and very sharply pointed, the inner valves apically very sharply pointed and decurved and with four ventral teeth, sharp and, especially the distal ones, very slender.

Measurements.—Pronotum, ♂, 4.5; ♀, 3.5 mm.; anterior femora, ♂, 5, ♀, 4.25 mm.; posterior femora, ♂, 10, ♀, 8 mm.; posterior tibia, ♂, 10.5, ♀, 9 mm.; ovipositor, 5 mm.; width, posterior femora at widest point, ♂, 3.3, ♀, 2.5 mm.

Holotype ♂, allotype ♀, paratypes A, adult ♂, B, C, D, and E, adult ♀ ♀, and F to K, immature males. All taken at the type locality by B. C. Marshall. All the adult material was taken in October, 1925, except one female, paratype C, which was taken the previous February. The nymphs were taken in February, March and October, 1925. All were sent pinned except paratypes D and E which were in spirits. Paratypes B and C appear as if they also had been preserved for a time in spirits as the colors seem somewhat faded.

Types.—Holotype, allotype and paratypes A, C, E, F, G and K in the National Museum (Cat. No. 28934, U. S. N. M.); the rest of the material returned to the collector.

Type locality.—Imboden, Arkansas.

SOME NEW PORTO RICAN SCALE PARASITES (HYMENOPTERA: ENCYRTIDAE).

By H. L. DOZIER,¹ *Delaware Agricultural Experiment Station.*

The writer while conducting some scale and whitefly parasite studies in Porto Rico, during 1925, reared a large number of very interesting forms, many of which proved to be new to science. Two of the species described in this paper are primary parasites of the Pustule Scale, which is a very destructive pest in the West Indies. This scale occurs in Florida, where it disfigures the oleander. It would be very interesting to determine whether or not these two parasites also occur there. Thanks are due Mr. P. H. Timberlake, who kindly confirmed the

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validity of these species and has helped the writer in many ways in his study of these minute parasites. The new genus is named in honor of Dr. Ricardo G. Mercet, who has recently revised and done so much in this group and who has also confirmed the validity of the genus and species.

MERCETIELLA, new genus.

Female: Closest perhaps to *Metaphycus*, but with the mesonotum and scutellum very strongly reticulated, and having no trace of parapsidal furrows. Scutellum no wider than long and decidedly more acute at apex than in *Aphycus* and with the setae long and bristle-like. Body rather robust and non-metallic, the abdomen rather short, rounded at the apex and with the ovipositor reaching internally nearly to the base; the tactile plates very much retracted and situated rather closer to the base than to the middle thereby differing from true *Aphycus*, which generally have the plates placed beyond the middle, at least in the female. Antennae of female are typical of Mercet's *Euaphycus* group, the funicle composed of six joints and the club three-segmented, but having the scape and pedicel microscopically reticulated. Mandibles tridentate, the three teeth being about equal in length and distinctly more acute than in the *Euaphycus* group. Maxillary palpi three-segmented, the labial palpi two-segmented. Wings *Aphycus*-like in arrangement and density of pubescence and in the shape of the submarginal vein; the marginal vein is distinctly longer than wide and the stigmal vein is comparatively short, wide at the apex and much constricted at its base.

Male: Differing from the female in having antennae with numerous long hairs which are longer and more prominent than in the species of true *Aphycus*. The hairs are about as long and prominent as in *Metaphycus melanostomatus*, but the first funicle joint is not lengthened as in that species. The reticulated scape and pedicel readily associate the male with the female even were biological data lacking.

Genotype.—*Mercetiella reticulata* Dozier.

Mercetiella reticulata, new species.

(Text figs. 1, 2, 3.)

Female.—Rather robust. Frontovertex over twice as long as wide, the ocelli placed in an acutely angled triangle. Eyes sparse and very finely hairy. Antennal scape cylindrical, narrow, and only slightly widened in center; pedicel almost as long as the first three funicle joints; first five funicle joints of nearly equal length, each gradually increasing in width until the sixth is almost twice as wide as the first; club elongate oval, slightly wider than the last funicle joint, slightly pointed at apex and as long as the last five funicle joints combined. Wings uniformly ciliated, the oblique hairless streak interrupted below, the cut-off portion separated from the basal hairless streak by two indistinct and faint rows of cilia. Pronotum, metanotum, and propodeum distinctly reticulated and with sparse whitish hairs.

Coloration.—Head including the eyes black, vertex yellowish with its base darker. Thorax black which becomes brownish in balsam-mounted specimens and in these a narrow, pale, median, longitudinal stripe becomes visible. Abdomen testaceous yellow, with a median irregular fuscous patch on dorsum near base; slight infuscation along the posterior margins; in balsam-mounted specimens this dorsal fuscous patch breaks up into a more irregular, less noticeable patch, distinctly reddish in color. Antennae yellowish, scape without markings, pedicel and club brown, the first five funicle joints very slightly darker than the sixth. Legs whitish except the tarsi, which are testaceous yellow, the fore-legs without markings; the middle femora with an interrupted, distally located, indistinct blackish band, the tibiae with two more or less interrupted blackish bands; the hind tibiae with two more or less distinct blackish bands.

Length (exclusive of ovipositor).—.820-.920 mm.

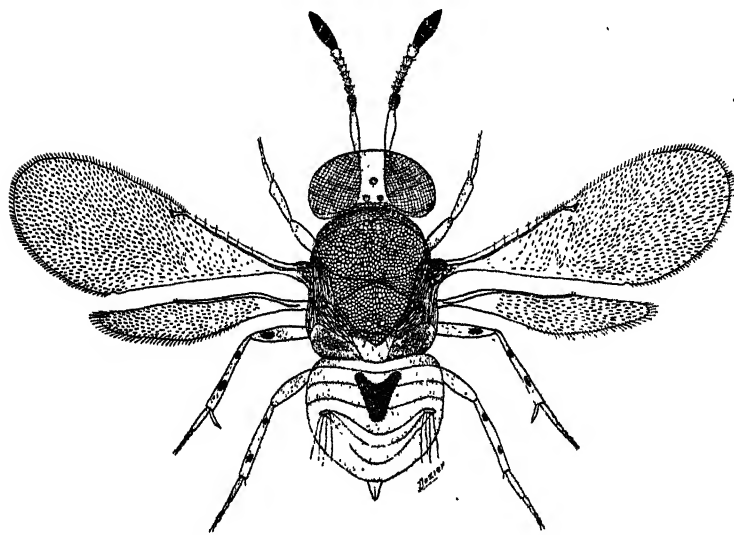


Fig. 1. *Mercetiella reticulata*, adult female, greatly enlarged.

Male. Pubescence of the eyes sparse and very short and fine. Antennae with numerous long, conspicuous hairs; scape and pedicel reticulated; scape very slightly widened in the center where it is about as wide as the pedicel which is decidedly wider than the joints of the funicle; all joints of the funicle increase in length so that the sixth is over twice as long as the first and nearly as wide as the club; the club nearly three times as long as the sixth funicle joint.

Entire body black, becoming brown in balsam mounts. Antennae entirely dusky. Fore and middle legs dusky, lightened up at the distal and proximal ends of femora and tibiae; tibiae of hind legs with two more or less distinct blackish bands.

Length.—.820 mm.

Described from a series of four females and one male reared from the Pustule Scale, *Asterolecanium pustulans*, on Balsa wood tree, Nov. 23, 1924, twelve females and two males reared from same insect on *Cassia fistula* tree during May 16-21, 1925, and a large series of males and females reared from similar material November, 1925; all reared by the writer from material collected at Rio Piedras, Porto Rico.

Holotype male, allotype and one paratype female on same slide, and two females and two males mounted on card points, deposited in the U. S. National Museum (Type Cat. No. 28982); paratypes in collections of the writer, P. H. Timberlake, R. G. Mercet, and the Porto Rican Insular Experiment Station.

Descriptions are made from slide-mounted specimens and fresh living material. This species is a primary parasite of *Asterolecanium pustulans*, and aids in checking this serious pest of the fig, *Cassia fistula*, silver oak (*Grevillea* sp.), oleander, mulberry, and many other trees and shrubs.

According to Mr. P. H. Timberlake, *Asterolecanium pustulans* is a common scale in Hawaii but has no parasites there except *Tomocera californica*. This latter parasite, so far, is not known to occur in Porto Rico and might prove a valuable introduction as it is also an enemy of the Black Scale, *Saissetia oleae*.

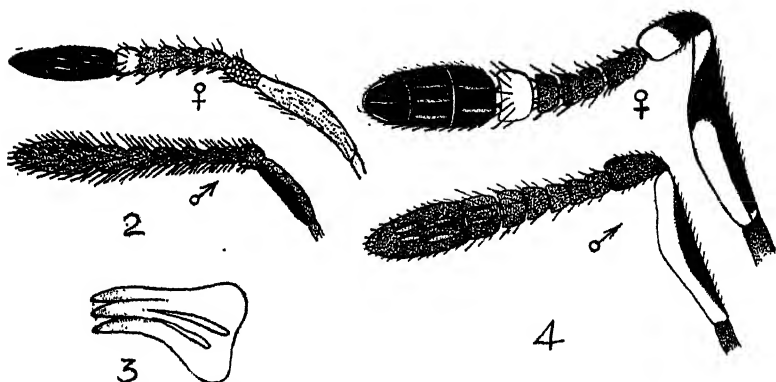


Fig. 2. *Mercetiella reticulata*, female and male antennae greatly enlarged.

Fig. 3. *Mercetiella reticulata*, mandible, greatly enlarged.

Fig. 4. *Euaphycus portoricensis*, female and male antennae, greatly enlarged.

***Euaphycus portoricensis*, new species.**

(Text fig. 4.)

Female.—Frontovertex over twice as long as wide, the ocelli placed in an equilateral triangle. Antennal scape long, narrow, flattened but not greatly

widened; pedicel about as long as the first three funicle joints combined, the first three funicle joints are of about the same length and width, the others distinctly increasing in width; club distinctly wider than the funicle, elongate oval, obtusely rounded at apex. Maxillary palpi three-segmented, the mandibles tridentate. Wings uniformly ciliated, the oblique hairless streak of the forewing interrupted by several rows of cilia. Ovipositor protruded.

Coloration. Head and body yellow with the mesonotum and scutellum distinctly orange. Eyes with greenish bloom in life. Antennal scape pale with the outer half fuscous; basal half of pedicel blackish, the apical half whitish; first five funicle joints and club brown, the sixth funicle joint whitish. Abdomen yellow with an irregular patch of brown on dorsum. Legs whitish, middle femora with indistinct black band, the tibiae with two black annulations; two more or less distinct bands on hind tibiae and the juncture of the femora with the tibiae, blackish; tarsi yellowish.

Length (exclusive of ovipositor).—960 mm.

Male.—Vertex, pronotum, mesonotum, and scutellum distinctly reticulated, quite similar to *Mercetiella reticulata*, the mesonotal hairs showing rather prominently on account of their dark color, abundant and bristle-like. Under high power of the microscope the hind margins of the abdominal segments are faintly reticulated. Antennae similar in shape to those of the female but the club is distinctly longer and more narrow in proportion.

General color brown with the dorsum of thorax black, the entire insect, however, lightens up when mounted in balsam on slides. Antennae entirely dusky except the scape, which is whitish with the outer margin striped with fuscous part of its length. The middle and hind tibiae with two more or less distinct black bands, and both distinctly black at the junction of the femora and tibiae.

Length.—760 mm.

Described from two females and one male May 14, 1925, and two females and one male Nov. 14–16, 1925, all reared by the writer from *Asterolecanium pustulans* collected at Rio Piedras, Porto Rico, on *Cassia fistula* and mounted in balsam on slides. This parasite is also a primary one but much less abundant than is *Mercetiella reticulata*.

Holotype female and allotype male on slides deposited in U. S. National Museum (Cat. No. 29070); paratype female in collection of P. H. Timberlake; others in the collection of the writer.

***Acerophagus nubilipennis*, new species.**

In Timberlake's table to members of this genus this species runs to *A. fasciipennis* Timb. but is quite distinct from that species.

Female.—Frontovertex about one half longer than wide, the ocelli placed in a triangle. Eyes not pubescent. The shorter and more basal tooth of the mandible is on the inner margin instead of the outer as in *A. fasciipennis*. Antennal scape very long and narrow, very slightly widened at middle, a little longer

than the funicle joints combined; the pedicel about as long as the first four funicle joints combined, decidedly wider than the latter but narrowed towards its base; the funicle joints successively increasing in width and slightly in length; the club is apparently solid. Mesonotum abundantly furnished with very fine light colored setae, a row of these near the hind margin much stronger and darker. Forewings uniformly ciliated except towards the base, the oblique hairless streak distinct.

General color a very pale yellow with the dorsum of a more pale orange tint, the abdomen pale with the hind margins of the two segments above the vibrissal plates brownish. Antennae dusky yellowish. Wings hyaline with the veins yellowish, the forewings with a very conspicuous smoky band extending in a somewhat triangular manner across the disk (in *A. fasciipennis* the band extends across disk in its full width); the tip of marginal vein and the stigma infuscated, forming a rather distinctive marking, and crossing the smoky band is a lighter transverse streak nearer the hind margin. Ovipositor not very much darker than the abdomen. Legs concolorous with the underpart of the body.

Length.—.76-.80 mm.

Described from two females, mounted on slides in balsam, one reared by the writer from *Pseudococcus aonidum* on Elephant Ear at Rio Piedras, Porto Rico, May 25, 1925, and the other from *Pseudococcus citri*, Rio Piedras, Porto Rico, May 26, 1925.

Holotype deposited in the U. S. National Museum (Cat. No. 29671) and the paratype retained in the private collection of the writer.

TAXONOMIC STUDIES OF THE LARVAE OF THE GENERA TENEBRIO AND NEATUS LE CONTE¹ (COLEOPTERA: TENEBRIONIDAE).

BY R. A. ST. GEORGE, *U. S. Bureau of Entomology.*

The present paper gives a generic characterization of the larvae of *Tenebrio* Le Conte and *Neatus* Le Conte; comments on the descriptions by previous authors of larvae representing different species of these two genera, and concludes with a specific key to these larvae.

GENERIC CHARACTERIZATION OF THE LARVAE OF TENEBRIO LE CONTE.

Mandibles of right and left sides differing in shape; both apically bifid (Fig. 2, a¹, a²) each with an additional tooth (t) between apex and molar part (m); tooth of right mandible (Fig. 2, t) prominent and placed near apex, that of left

¹Characterizations both of the family Tenebrionidae and the subfamily Tenebrioninae were given by the present writer in a previous paper. (No. 20, pages 2 and 3.) The numbers in the parentheses refer to literature cited in the bibliographic list.

(Fig. 1, t) less developed and placed closer to molar part; molar part of right mandible with bituberculate crown, that of left with hollow crown; ventrally with cutting part deeply excavated; exterior surface (the back of mandible) distally (c) rounded, without margination, and bearing a single seta on dorsal surface arising from a slight depression behind the apical teeth, proximally (p) (opposite the molar part) excavated, without membranous elevation, bearing four setae, two long chitinous ones on dorsal surface above fossa and two shorter ones ventrally near condyle.

Labrum medianly without a transverse, setose elevation and with a single seta on each side (Pl. 9, 5, lab).

Maxilla with mala conical at apex (Fig. 6, ma).

Epipharynx with only two hooks (short spinelike setae) on median soft-skinned portion (Fig. 7, h.)

Legs; the first pair not much larger and stronger than the second and third pairs (Figs. 11 and 12).

Pygidium apically bicornute with cerci curved upward and more or less reflexed; on each side anterior to cerci, two short chitinous spines; surface punctate (Fig. 25).

Tenth abdominal or "anal" segment small, ventral, bearing two projecting and retractile ambulatory papillae (Fig. 22, X, ap).

GENERIC CHARACTERIZATION OF THE LARVAE OF NEATUS LE CONTE¹

Mandibles as described above for the genus *Tenebrio*, except that in addition to the setae placed anteriorly and posteriorly on the back (exterior portion), other setae are placed between them along the dorsal and ventral margins (Fig. 3, p).

Labrum medianly without a transverse elevation, but with a series of long setae² (Fig. 4, lab).

Maxilla, *epipharynx* and *legs* as described in the genus *Tenebrio*.

Pygidium apically without cerci, subconically produced, not mucronate; many small spinelike setae (Fig. 26, IX), along each side, sometimes extending so far towards the center that in places they cross the tergum completely.

Tenth abdominal segment as described in the genus *Tenebrio*.

COMMENTS ON THE DESCRIPTIVE LITERATURE CONCERNING THE LARVAE OF SPECIES OF TENEBRIO AND NEATUS.

The larvae representing the different species of the genus *Tenebrio* have been described previously by various authors, but for the most part the descriptions are not very complete

¹A discussion of Le Conte's old genus *Neatus* is found on pages 9 and 10 of reference No. 20.

²This transverse series of setae corresponds in position to the setose elevation present in the labrum of the Blaptinae and may suggest that the genus *Neatus* in this respect constitutes a link between the two closely related subfamilies Blaptinae and Tenebrioninae (Comp. No. 20, pp. 3-6).

and are of too general a nature to enable a definite separation of the species. In some instances statements have been made in these descriptions which have allowed or caused misinterpretation or which have been entirely erroneous. In fact in the entire literature on the subject only two contributions are of permanent value, namely, Schiödte's description of the larva of *Tenebrio molitor* (No. 19, pages 568 to 571) and Arendsen Hein's careful work (No. 1) dealing with the following four species,—*Tenebrio molitor* Linnaeus, *Tenebrio obscurus* Fabricius, *Tenebrio picipes* Herbst and *Tenebrio opacus* Duftschmidt and some varieties and cross-varieties of *Tenebrio molitor*.

The present writer, in descriptions of *Tenebrio molitor* and *Tenebrio obscurus* (No. 5), has recently given additional morphological characters for the separation of these species and, in so far as was possible, stated which of these characters are constant and which vary and to what extent.

Even in the best descriptions slight attention has hitherto been given to occasional variations which are rather frequent in the genera in question. Thus Schiödte in his description of the number of spines on the various articles of the legs of *Tenebrio molitor* only gives a sole and definite number in each instance.

The larval characters given by Arendsen Hein are partly based upon the position of certain impressions to the light-colored segmental bands of mature specimens. The present writer has felt somewhat uncertain at times in using these characters, not only when the larvae were immature and not fully colored but also when they had been preserved in alcohol for several years as is often the case with Museum specimens. Where Arendsen Hein has counted thirteen segments in the larva of *Tenebrio*, giving the head as one (No. 1, page 127), it should read fourteen, as the tenth abdominal segment being ventral and small has been overlooked. He also describes the antennae of *Tenebrio* larvae as four jointed (No. 1, page 127), as does Mulsant (No. 14, page 10, u. 12) and Chapuis (No. 4, page 514, u. a) adding the remark that he could not verify the statement of Mulsant and Guillebeau (No. 15, page 12) that the antennae of the larvae of *Tenebrio picipes* Herbst are five jointed. The present writer, however, has found, as did Schiödte (No. 19, page 568-571) that the larvae of *Tenebrio* have only three articles (Figs. 14, 15, 16 and 17). Undoubtedly Arendsen Hein, who figures correctly the antennae (No. 1, page 129) of *Tenebrio*, has come to his number by counting the basal articulating membrane (Fig. 16, bm) as article one; his second is the true basal or first article.

Dealing with the cerci on the ninth abdominal segment, Seidlitz (No. 8, pages 632-634) and Mulsant (No. 15, page 11)

describe them as being almost horizontal in *Tenebrio opacus*. The correctness of this statement is denied by Arendsen Hein (No. 1, page 129), and in this respect the present writer agrees with Arendsen Hein.¹

Mulsant has probably worked with a larval skin in which the cerci were out of their natural position, and Seidlitz has simply quoted Mulsant.

On the other hand the writer can not fully agree with Arendsen Hein when he remarks (No. 1, page 134) that he had not been able to confirm the observations of Mulsant (No. 15, page 11), Seidlitz (No. 8, pages 632-634) and Schiödte (No. 19, pages 571) that the cerci in *Tenebrio opacus* (Figs. 22 and 25, IX) are more slender and longer than in *Tenebrio molitor*. An examination of one of the original larvae² from which Schiödte's description was made shows that the cerci of this specimen were not much longer than those of *Tenebrio molitor* (Fig. 24, IX) but only about one-third as wide at base, giving to them the appearance of being long and slender (Fig. 22, IX).

The pygidial segment of the larva of *Neatus picipes* is conically produced but does not end in a single spine as described by Mulsant, whom Seidlitz quoted in this respect, and Arendsen Hein is right in correcting their statements; on the contrary it is not mucronate. Along the sides and sometimes extending so far towards the center that they, in places, cross the tergum completely, are many small spinelike setae. Occasionally one of these small spines is placed at the apical end (Fig. 26, IX), and this may have been the case in the specimen before Mulsant, but such a spine is always of the same size as the others. He compares, however, this pygidial spine with the cerci of the species of *Tenebrio* (Figs. 22, 23, and 24, IX), and if his specimen really had a spine as large as that it must have been a species of *Alphitobius* (Fig. 27, IX) rather than of *Neatus* (Fig. 26, IX).

Arendsen Hein has pointed out that the length of the longitudinal line above the abdominal spiracles (Figs. 18, II), and

¹Seidlitz has used this character in a key (No. 8, page 630) and this key was translated and incorporated in a previous paper by the present writer before this mistake was noticed (No. 20, page 10).

²This larva is now present in the National Museum, Washington, D. C. It was sent by Meinert to C. V. Riley in 1890 and was taken from the jar in the collection of the Zoological Museum in Copenhagen, Denmark, that contained the larvae from which Schiödte's description was made. In *Entomologiske Meddelelser*, Vol. 4, page 65, 1893-1894, we have the following record of this material: "The Museum (of Copenhagen) possesses six larvae (of *Tenebrio opacus* Duft.) presented by Mr. Lövendal, also four larval skins and one pupa (obtained) from hollow oaks at Jaegerspris. The four larval skins are from specimens reared into imagines."

the closeness of the spiracles to this line may be used as characters for the separation of the different species of *Tenebrio*. In *Tenebrio molitor* he finds that this line (Figs. 18, 11) runs to (or slightly beyond) the spiracle, but does not extend into the light colored marginal band (mb) which encircles the segment anteriorly, and the spiracles (especially the first abdominal) are close to the longitudinal line. In *Tenebrio obscurus* (Fig. 19), *Tenebrio opacus* (Fig. 21) and in *Neatus picipes* (Fig. 20), the lateral line (11) extends deeply into the light marginal band (mb) and the spiracles are farther away from the line than in *Tenebrio molitor* (Fig. 18). In *Tenebrio opacus* the spiracle is almost circular (Fig. 21), in *Neatus picipes* (Fig. 20) and in *Tenebrio obscurus* (Fig. 19) broadly oval, that of the latter being slightly less oval than that of the former. In *Tenebrio molitor* (Fig. 18) the form of the spiracle approaches that of *Tenebrio obscurus* (Fig. 19), but is still less broadly oval and almost narrowly oval.

Key to the Described Species of Larvae of Tenebrio and Neatus.

Pygidium without cerci, not mucronate, but with many small spine-like setae along the side and sometimes extending so far towards the center that they, in places, cross the tergum completely, occasionally with one of these small spines placed at the apical end (Fig. 26, IX); labrum with a transverse series of setae placed medianly (Fig. 4, lab); mandible with many setae in an almost continuous row along exterior surface (Fig. 3).....

Neatus picipes Herbst = *Tenebrio picipes* Herbst.

Pygidium bicornute, on each side anterior to cerci, with two small chitinous spines (Fig. 23, IX); labrum without a transverse series of setae placed medianly (Fig. 5, lab); mandible on exterior surface (Figs. 2, 3, p), anteriorly with one seta, posteriorly with two dorsal and two ventral setae.....1.

1. Trochanter of prothoracic leg armed distally with two strong spine-like setae on the inner margin (Fig. 11, tr); longitudinal line (Fig. 18, 11) (just above the spiracle) running to or slightly beyond the spiracle, extending forward not more than the length of the diameter of the spiracle; spiracle as close to line as thickness of the thickest part of the peritremal frame (p); ventral side of labrum with a series (about 12 or 13) of irregularly placed, short, spine-like, slightly curved setae set in the anterior corners (Fig. 7).....*Tenebrio molitor* Linnaeus.

— Trochanter of prothoracic leg armed with one strong spine-like seta (Fig. 13, tr); longitudinal line running well beyond the spiracle and extending into the light colored marginal band which encircles the segment anteriorly (Figs. 19 and 21); spiracle at a distance from the line more than the thickness of the peritremal frame; ventral side of labrum with only a few (usually not more than four) short spinelike setae set in the anterior corners (Figs. 8 and 9).....2.

2. Pygidium with longitudinal axes of cerci perpendicular to surface of tergum, cerci slender and only slightly divergent (Figs. 22, 25, IX); abdomi-

nal spiracles small, almost circular (Fig. 21); second (postapical (antennal article nearly three times as long as wide (Fig. 15).....

Tenebrio opacus Duftschmidt.

- Pygidium with longitudinal axes of cerci oblique to surface of tergum, cerci about the same length as in *Tenebrio opacus* but much thicker at the base and quite strongly divergent (Fig. 23, IX); abdominal spiracles large, broadly oval (Fig. 19); second antennal article four times as long as wide (Fig. 16).....*Tenebrio obscurus* Fabricius.

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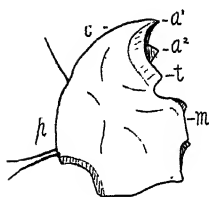
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—* Quotations marked with (*) from other authors and not verified by the present writer.

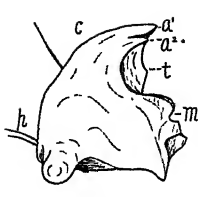
EXPLANATION OF PLATE 9.

Figures drawn with aid of camera lucida by the author.

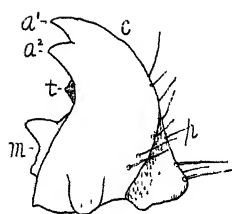
- Fig. 1. *Tenebrio obscurus*. Dorsal side of left mandible; a¹, a² the bicuspidate apex; t, tooth of cutting edge; m, molar part; c, rounded surface on exterior side of cutting edge; p, excavation opposite molar part.
- Fig. 2. *Tenebrio obscurus*. Ventral side of right mandible; explanation of letters as for figure 1.
- Fig. 3. *Neatus picipes*. Ventral side of left mandible; explanation of letters as for figure 1.
- Fig. 4. *Neatus picipes*. Anterior portion of head of larva from above, showing the clypeus (cl) and labrum (lab).
- Fig. 5. *Tenebrio obscurus*. Anterior portion of head of larva from above, showing the clypeus (cl) and labrum (lab).
- Fig. 6. *Tenebrio molitor*. Maxilla of larva from ventral side; mxp, maxillary palpus; ma, mala; pag, basal membrane of maxillary palpus; sti, stipes maxillaris; ca, cardo; ar, maxillary articulating area.
- Fig. 7. *Tenebrio molitor*. Epipharynx and anterior margin of labrum; eph, epipharynx; so, so₁ and so₂, sensory organs; h, median hooks; tb, transverse band; t and t₁, teeth.
- Fig. 8. *Tenebrio opacus*. Epipharynx and anterior margin of labrum; explanation of letters as for figure 7.
- Fig. 9. *Neatus picipes*. Epipharynx and anterior margin of labrum; explanation of letters as for figure 7.
- Fig. 10. *Neatus picipes*. Right prothoracic leg of larva, showing anterior view; cox, coxa; tr, trochanter; fe, femur; ti, tibia; ta, tarsus.
- Fig. 11. *Tenebrio molitor*. Left prothoracic leg of larva, showing posterior face; explanation of letters as for figure 10.
- Fig. 12. *Tenebrio molitor*. Left mesothoracic leg of larva, showing posterior face; explanation of letters as for figure 10.
- Fig. 13. *Tenebrio obscurus*. Right prothoracic leg of larva, showing anterior face; explanation of letters as for figure 10.



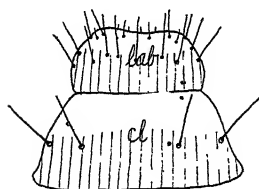
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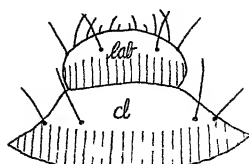
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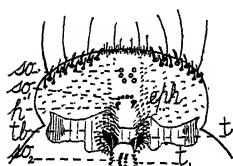
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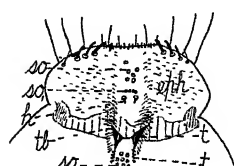
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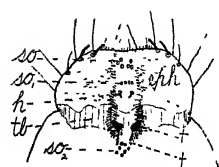
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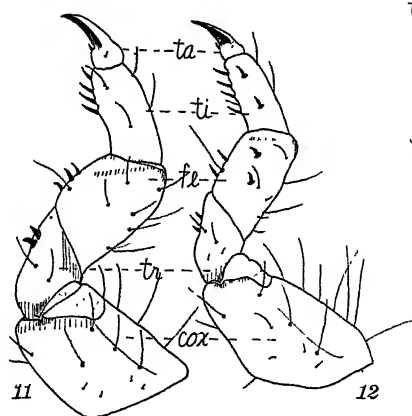
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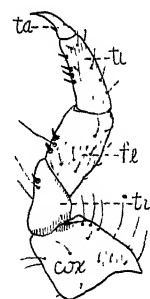
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EXPLANATION OF PLATE 10.

- Fig. 14. *Neatus picipes*. Antenna of larva; bm, basal articulating membrane.
- Fig. 15. *Tenebrio opacus*. Antenna of larva.
- Fig. 16. *Tenebrio obscurus*. Antenna of larva; bm, basal articulating membrane; 1, first or basal article; 2, second or postapical article; 3, third or apical article.
- Fig. 17. *Tenebrio molitor*. Antenna of larva.
- Fig. 18. *Tenebrio molitor*. Side view of first abdominal segment with spiracle and longitudinal line greatly magnified; mb, marginal band; ll, longitudinal line; p. peritremal frame.
- Fig. 19. *Tenebrio obscurus*. Side view of first abdominal segment (I) with spiracle and longitudinal line greatly magnified; explanation of letters as for figure 18.
- Fig. 20. *Neatus picipes*. Side view of first abdominal segment with spiracle and longitudinal line greatly magnified; explanation of letters as for figure 18.
- Fig. 21. *Tenebrio opacus*. Side view of first abdominal segment with spiracle and longitudinal line greatly magnified; explanation of letters as for figure 18.
- Fig. 22. *Tenebrio opacus*. Pygidium of larva; side view, showing posterior portion of eighth (VIII), ninth and tenth abdominal segments; IX, IX, ninth abdominal ("pygidial") segment, dorsal and ventral parts; X, tenth abdominal ("anal") segment, showing upper and lower lips; b and c, two-folded articulating membrane between ninth and tenth segments; ap, ambulatory papilla.
- Fig. 23. *Tenebrio obscurus*. Pygidium of larva, side view; explanation of numbers and letters as for figure 22.
- Fig. 24. *Tenebrio molitor*. Pygidium of larva, side view; explanation of numbers and letters as for figure 22.
- Fig. 25. *Tenebrio opacus*. Pygidium of larva, dorsal view; VIII, posterior portion of eighth abdominal segment; IX, ninth abdominal segment.
- Fig. 26. *Neatus picipes*. Pygidium of larva, dorsal view; explanation of numbers as for figure 25.
- Fig. 27. *Alphitobius* species. Pygidium of larva, dorsal view; explanation of numbers as for figure 25.
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**THE OCCURRENCE OF AN AMERICAN GENUS IN EUROPE AND
A EUROPEAN GENUS IN AMERICA (DIPTERA:
SYRPHIDAE; SEPSIDAE).**

BY RAYMOND C. SHANNON, *U. S. Bureau of Entomology.*

While I was visiting Herr Theodor Becker at his home in Leignitz, Germany, last July (1925), he gave me a male and female of a new species of *Chalcomyia*, a genus of Syrphidae hitherto known only from America, with his permission to describe and deposit the types in the U. S. National Museum. He has also determined for me specimens of a species of Sepsidae, *Amphipogon spectrum* Wahlberg, which my wife and I collected in Czecho Slovakia. A variety of the same species occurs in the northwestern part of America, but it has heretofore been known under the name of *Ambopogon hyperboreus* Greene.

The new species of *Chalcomyia* makes the sixth species for the genus and at the same time extends its range to the Old World. In a recent synopsis of the genus¹ attention was called to the fact that the subquadrate scutellum, the principal character upon which the genus was originally based, is peculiar only to the genotype *area* Loew, and in this paper other characters were used to define the genus. The present new species does not have the scutellum developed subquadrate but in all other respects it is essentially a member of *Chalcomyia*.

Since the above mentioned synopsis was published Mr. Curran has published a bulletin (Kansas Univ. Bull., vol. 15, 1925, p. 122) in which he describes and figures a new species of *Chalcomyia* from North America for which he erected a new subgenus, *Chalcosyrphus*. In the key given below all of the known species of the genus are included, as well as the new subgenus proposed by Curran.

CHALCOMYIA Williston

Third antennal joint suborbicular, with a dorsal, basal arista; mesonotal pile extending upon the humeral calli and the region between them; males with four abdominal segments; head triangular in frontal aspect; face black, usually deeply concave, tuberculate only in *cyanea*; a distinct petiole beyond the first posterior cell which is shorter than the discal crossvein; second vein distinctly curved upwards at its apical end; body pile normal; males dichoptic.

Key to Species of Chalcomyia.

- A1. Mesonotum and scutellum without a flattened area; second tergite very much broader than long; hind femur but little swollen.....

Subgenus *Chalcomyia* Williston.

¹ Shannon, The Genus *Chalcomyia*, Occasional Papers, Bost. Soc. of Nat. History, vol. 5, 1925, pp. 151-153.

- B1. Greenish bronze, clothed with short yellow pile; tibiae and tarsi largely yellow; scutellum subquadrate. Male: face without tubercle; eyes well separated, sides of front parallel on upper half.....
area Loew.
- B2. Not greenish bronze or with yellow pile; only bases of tibiae yellow; scutellum not markedly subquadrate.
- C1. Discal crossvein joining discal cell distinctly before its middle; length of posterior crossvein much less than length of section of fourth vein above it.
- D1. Mesonotal pile pale. Male: Face with a slight tubercle....
cyanea Smith.
- D2. Mesonotal pile blackish. Male: Face evenly concave.....
beckeri, new species.
- C2. Discal crossvein joining discal cell nearly at its middle; posterior crossvein subequal to section of fourth vein above it. Male: Unknown.....
anomala Shannon.
- A2. Mesonotum flattened on apical third, scutellum flattened on disc; second tergite quadrate; hind femur much swollen.....
Subgenus *Chalcosyrphus* Curran.
- B1. Third antennal joint shorter than basal two combined. Male: Face without tubercle; eyes distinctly converging and rather closely approximated.....
depressa Shannon.
- B2. Third joint longer than basal two combined. Male: Unknown.....
atra Curran.

***Chalcomyia beckeri*, new species.**

Male.—Antennal prominence rather pronounced but less so than in other species of the genus; eyes fairly well separated; the front constricted at the middle, gradually widening above the constriction to the vertex and below widening more broadly downwards; front entirely shining black with a few hairs in ocellar region; antenna yellowish brown; arista darker, about one and one-third times the length of antenna and shorter than width of face across its middle; face black, extensively overlaid with silvery pollen; thorax black with blackish pile which is stiff and coarser along margins of mesonotum and scutellum; legs black, bases of all tibiae yellowish, lower surface of tarsi brownish, abdominal pile pale; basal corners of tergites extensively and faintly pilose; wings slightly tinged; squamae white; halteres yellow.

Female.—Front gradually widening downwards, width at vertex equal to length of antenna, width across base of antennae a little less than length of arista; face less pollinose than in male; abdomen very broad and flat, pale pilose.

Length: 8.5 mm.; wing 8 mm.

Male, type, Wölfelsfall, Germany, May 17; female, allotype, Altwater, Moravia, June (Theodor Becker). Other specimens, of type series, in collection of Theodor Becker.

Type.—Cat. No. 28727, U. S. N. M.

The general appearance of *C. beckeri* is very similar to that of

the other species of the genus, except *depressa* and *atra*. The shape of the abdomen differs in each sex (exclude *depressa*), but in each case the appearance is quite characteristic and peculiar to the genus. The males of *area*, *cyanea*, and *beckeri* have the abdomen broadening out very abruptly just beyond the base, and beyond the base of the third tergite it tapers rapidly to a rather sharp apex; the hypopygium is prominent and has a definite twist to the right.

The females of *area*, *anomala*, and *beckeri* have an unusually broad and flat abdomen.

This species is named for Theodor Becker, one of our foremost dipterologists. The writer wishes to express his appreciation to Mr. Becker for his generosity in permitting him to study this species.

Genus **AMPHIPOGON** Wahlberg.

Amphipogon Wahlberg, Ofvers. af Kongl. Ventensk. Akad. Förh., vol. 10, 1844, p. 217.

Ambopogon Greene, Proc. Ent. Soc. Washington, vol. 21, 1919, pp. 126-128, figures.—vol. 23, 1921, pp. 107-109.

Genotype.—*Amphipogon spectrum* Wahlberg, *ibid*.

Amphipogon spectrum hyperboreus (Greene).

Ambopogon hyperboreus Greene, *ibid*.

The occurrence of this fly in North America was first made known in 1919, when Mr. C. T. Greene published a paper entitled "A New Genus of Scatophagidae" in which he described and figured a single male specimen which had been collected on the Alaska-Yukon border, latitude 69-10 North, longitude 141 West.

A year later the writer collected several males and a female on the forested slopes of Cedar Mountain, Idaho.

While collecting with Mrs. Shannon at Mezimesti, Czecho-Slovakia, August 2, 1925, to my great surprise, we found what appeared to be the same species of this very peculiar fly on a fallen fir log in one of the cultivated forests, strutting around in the same manner I had observed in the flies I collected on Cedar Mountain. Specimens were sent to Theodor Becker who determined them as *Amphipogon spectrum*. The male of the American specimens differ from the European specimens in having the hypopygial hairs consolidated into a single tuft, whereas in the European specimens of *spectrum* the hairs are divided by a well marked space making two tufts thereby.

The name *hyperboreus* is retained therefore as a varietal name for the American form, making the combination *Amphipogon spectrum hyperboreus* (Greene).

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No. 6

SYNOPSIS OF THE AMERICAN CALLIPHORIDAE (DIPTERA).

BY RAYMOND C. SHANNON, *U. S. Bureau of Entomology.*

A study of the American (North, Central and South America, West Indies and Galapagos Islands) Calliphoridae in the collection of the U. S. National Museum, which contains a nearly complete representation of all the species recorded from America, has permitted the writer to prepare this brief synopsis of practically all of the known American flies of the family Calliphoridae. This is the first attempt to treat all of the species occurring in this region.

In addition to studying the collection of the National Museum the writer, while in Europe (1925), had, through the courtesy of Mons. E. Segúy, the opportunity to examine the remaining types of Robineau-Desvoidy and Macquart collections in the Paris Museum, and through the courtesy of Major E. E. Austen the Walker types in the British Museum. While examining these collections a few species which were not represented in our National Collection were seen and a number of synonyms discovered.

During the last year (1925) the writer has examined several large collections of North American Calliphoridae, submitted to him for identification. Chief among these were: The collection of the Dallas, Texas, laboratory of the Bureau of Entomology (submitted by F. C. Bishopp); a collection made in Alaska by Professor J. S. Hine; material from Washington State loaned by Professor A. L. Melander; material from western Canada loaned by Owen Bryant; a collection from Canada loaned by C. Howard Curran. In addition to these collections Mr. C. W. Johnson, Dr. F. R. Cole and the University of Kansas have sent me important specimens for examination. This material has supplied several new species as well as the unknown sex of several species which had been previously described from one sex only.

To all of the above named gentlemen and also to Dr. J. M. Aldrich, Mr. J. R. Malloch, and my wife, Elnora S. Shannon (for assistance in recording data, etc.), I wish to extend my thanks for their interest and assistance in the present paper.

A short list of the more important recent papers bearing on the group is appended at the end and references to all of

the previously described species are found therein. This includes Townsend's catalogue of the South American Calyptrate Muscidae which contains the bibliography of the older papers.

Perhaps most or all of the indigenous species of North America are now known. Three genera, *Protocalliphora*, *Sterigomyia* and *Melanodexia*, however, require more material and study before we can be sure of the limits and the number of their species. These are the only genera in which one or the other sex of some of the species remain unrecognized.

The number of species of Calliphoridae, aside from the genus *Mesembrinella*, inhabiting Central and South America, is apparently quite limited, although about three times the number of names have been given to them. This large number of synonyms has caused considerable confusion and made the identification of species very difficult. The papers by Dr. Aldrich (1922 and 1925) have helped considerably in stabilizing our knowledge of the two largest groups of this region, the Mesembrinellinae and Chrysomyiini, and his key to the former group is reproduced herein.

Aside from the Mesembrinellae, the Calliphorid fauna of tropical America and the regions southward appears to be a scant one, at least in collections. The number of new forms awaiting discovery may, however, be large and therefore the present paper should be considered of a provisional nature for this region and mainly applicable to the common species.

The flies of the family Calliphoridae, like the house-fly, are commonly known to every one, and some of them have well established common names such as the screw-worm flies (Chrysomyiini); green-bottle flies (Luciliini); blue-bottle flies (Calliphorini); blow-flies (Calliphorini, *Phormia* and *Protophormia*), and cluster flies (*Pollenia rudis*).

A number of them are of considerable economic importance from medical, veterinary, and sanitary standpoints. Probably all of the species in the larval stage are flesh feeders (chiefly on carrion) though some will also breed in the excrement of carnivorous and omnivorous animals, including man. Certain species attack live stock and at times cause considerable losses in cattle and sheep.

Myiasis in man, occasionally followed by death, occurs not infrequently in some regions, as a result of certain of these flies laying their eggs on wounds or diseased tissue, where the larvae upon hatching can feed on the surrounding parts.

A brief summary is here appended showing the general distribution in America and the larval habits of the groups:

Mesembrinella: Tropical America. Scavengers.

Chrysomyiini: Throughout America. Screw worm flies. All?

Phormia: North America. Carrion; sometimes producing myiasis.

Protophormia: As in *Phormia*.

Boreëllus: Subarctic. Habits unknown.

Protocalliphora: North America. Parasites of nestling birds.

Lucilini: Throughout America. Carrion; some species frequently produce myiasis; some parasitic on toads.

Calliphorini: Chiefly North America, rare in the Andes. Chiefly scavengers, sometimes produce myiasis.

Pollenia: North America. Parasites of earth worms.

Melanodexia: California, Oregon. Habits unknown.

The family Calliphoridae belongs to the higher Muscoid Diptera,¹ a group characterized by the presence of a well-defined row of hypopleural bristles. From the Tachinoidea, which have a well-developed post scutellum and the lateral margins of the tergites usually meeting on the ventral median line of the abdomen, thereby obscuring the sternites, the Sarcophagoidea may be separated by the undeveloped post scutellum (subdeveloped in *Mesembrinella*) and the side edges of the tergites usually well separated, so that sternites two to five, while reduced, usually are distinctly visible.

The Sarcophagidae and Calliphoridae are very closely allied and may eventually be considered as one family. Within the limits of our fauna the two may be differentiated as follows:

SARCOPHAGIDAE: Post humeral bristle usually present and placed mesad of the presutural; usually four notopleurals; propleura and prosternum usually bare; stem vein not ciliated; very rarely with metallic blue or green coloration; usually opaque gray and the abdomen with a checkered appearance.

CALLIPHORIDAE: Post humeral bristle rarely absent and usually placed laterad of the presutural (in Pollininae it may be laterad, in line with or mesad of presutural, or absent); usually two, rarely three (some species of *Protocalliphora*) notopleurals; propleura and prosternum pilose (bare in Polleninae); stem vein ciliated in Chrysomyiinae and *Mesembolia*; usually metallic green, blue or purplish in appearance, opaque gray in Polleninae.

Key to the Subfamilies, Tribes and Genera of American Calliphoridae.

1. Post scutellum rather well developed; bucca very narrow, about one-fifth to one-sixth height of eye; arista plumose to tip; bend of fourth vein obtuse and broadly rounded; metathoracic spiracle as broadly rounded anteriorly as it is posteriorly; disc of squamae bare; stem vein sometimes setose; female usually with a pair of decussate bristles on frontal vitta. (Tropical America).....Subfamily Mesembrinellinae.

Genus *Mesembrinella* Giglio-Tos.

¹(Superfamily Tachinoidea (including Tachinidae and Dexidae) and superfamily Sarcophagoidea (including Sarcophagidae and Calliphoridae).

- Post scutellum undeveloped; bucca subquadrate, about one-half eye height; bend of fourth vein usually strongly angled; metathoracic spiracle tapering anteriorly; female rarely with decussate bristles on frontal vitta.....2.
2. Stem vein on upper side and subcostal sclerite setose.....3.
- Subfamily Phorminae.
- Stem vein bare; subcostal sclerite setose only in *Lucilia caesar* and *Pollenia*.....17.
3. Arista bare. (Chile).....Tribe Trixoneurini.
- Trixoneura*, new genus.
- Arista distinctly plumose.....4.
4. Stem vein setose below as well as above. (South American, chiefly in the Andes).....Tribe Toxotarsini.....5.
- Stem vein bare below.....9.
5. Hind basitarsus arcuated.....*Toxotarsus* Macquart.
- Hind basitarsus straight.....6.
6. One sublateral; no posterior acrostichals.....*Sarconesia* Bigot.
- Two to three sublaterals; two to three posterior acrostichals.....7.
7. Arista plumose less than half its length; two posterior acrostichals (middle pair absent).....*Chlorobrachycoma* Townsend.
- Arista plumose a little more than half its length; three posterior acrostichals.....8.
8. Large robust flies, 12-18 mm. Male: Eyes widely separated, legs conspicuously hairy; mid-basitarsus enlarged at apex; forceps consolidated into a single style. Female: Front much broader than length of third antennal joint.....*Neta*, new genus.
- Moderate size, 7-10 mm. Male: Eyes closely approximated; legs not hairy; mid-basitarsus not swollen at apex; two well-developed pairs of forceps. Female: Front narrower than length of third antennal joint.....*Sarconesiopsis* Townsend.
9. Face yellow with mostly yellow pile; one post humeral bristle (throughout America).....Tribe Chrysomyiini.....10.
- Face black with black hairs; lower squama bare; usually two post humerals.....Tribe Phormini.....14.
10. Lower squama partly pilose on outer as well as basal half. (Chiefly eastern hemisphere, one species in America).....*Chrysomyia* R.-Desvoidy.
- Lower squama bare on outer half.....11.
11. Lower squama with distinct hairs on basal portion; mesonotum strongly vittate; dorsocentrals 0:1 or 0:2; disc of upper squama in female with distinct hairs.....12.
- Lower squama bare or faintly pubescent on basal portion; mesonotum without distinct vittae; dorsocentrals 2:4; disc of upper squama of female bare.....13.
12. Palpi short and slender.....*Cochliomyia* Townsend.
- Palpi normal, clavate.....*Paralucilia* Brauer and Bergenstamm.
13. Vibrissae at oral margin, hardly approximated.....*Hemilucilia* Brauer.
- Vibrissae at least length of second antennal joint above oral margin.....*Chloroprocta* Van der Wulp.

14. Anterior acrostichals not distinct from surrounding hairs; squamae darkened; outer portion of disc of upper squama thinly haired.....15.
Anterior acrostichals well differentiated from surrounding hairs; squamae rarely darkened.....16.
15. Head strongly triangular in frontal aspect; arista thickened and with short appressed rays; prothoracic spiracle much larger than third antennal joint.....*Borellus* Aldrich and Shannon.
Head very obtusely triangular; arista and aristal rays normal; prothoracic spiracle about size of third joint.....*Protophormia* Townsend.
16. Four anterior dorsocentrals; prothoracic spiracle distinctly light orange; opaque area (outer portion) of upper squama thinly haired.....
Phormia R.-Desvoidy.
Three anterior dorsocentrals; prothoracic spiracle dark orange to black; upper squama without hairs on upper surface.....*Protocalliphora* Hough.
17. Prosternum and propleura pilose; more or less metallic green to blue to purple; pilosity of parafacials not extending down as far as lowermost margin of eye.....Subfamily Calliphorinae.....18.
Prosternum and propleura bare; without evident blue, green or purple reflections, abdomen usually tessellated in appearance; parafacials pilose as far down as lowermost eye margin. (North America).
Subfamily Polleniinae.....22.
18. Parasquamal tuft present; lower squama bare. (Throughout America).
Tribe Luciliini.....19.
Without a parasquamal patch of hairs; lower squama with distinct hairs. (Chiefly North America, rare in Andes).....Tribe Calliphorini.....20.
19. Very large robust species, 18-20 mm.; no anterior acrostichals; one sublateral.....*Blepharicnema* Macquart.
Moderate in size, 6-12 mm.....*Lucilia* R.-Desvoidy.
20. One sublateral; two bristles near middle on exterior surface of fore tibia; two post acrostichals.....*Cynomyia* R.-Desvoidy.
Two or three sublaterals; usually one bristle on¹ exterior surface of fore tibia; three post acrostichals.....21.
21. Antenna of normal size, third joint longer than length of dorsal bristle on second joint; section of costa between auxiliary and first veins longer than section between tips of second and fourth veins; last section of fourth vein (apical crossvein) usually with a decided bend.....
Steringomyia Pokorný and *Calliphora* R.-Desvoidy.
Antenna black, small, third joint only as long as dorsal bristle on second joint; section of costa between auxiliary and first veins distinctly shorter than section between second and fourth veins; last section of fourth vein straight or but gently curved.....*Onesia* R.-Desvoidy.
22. Lower squama broader than long, the mesal margin in contact with metanotum; anterior mesonotal bristles: 2 acrostichals; 2 dorsocentrals; 2 sublaterals; one post humeral; one presutural; thorax, in fresh condition, clothed with deciduous yellow pile.....*Pollenia* R.-Desvoidy.

¹The European genus *Melinda* R.-Desvoidy, which may eventually be reported from America, has the squamae bare.

Lower squama a little longer than broad, the mesal margin well separated from thorax; presutural bristles: 2 acrostichals; 2 dorsocentrals; 1 sublateral; no post humeral; 1 presutural; thorax without yellow pile
Melanodexia Williston.

Key to species of Mesembrinella (from Aldrich, 1925).

1. Stem vein bare (subgenus *Mesembrinella*).....2.
- Stem vein ciliated (subgenus *Mesembolia* Aldrich).....20.
2. Two presutural bristles.....3.
- One presutural.....7.
3. Legs almost black, but middle and hind femora yellow on apical half....4.
- Femora and tibia yellow.....5.
4. Wing with heavy subcostal black stripe not reaching third vein, posterior portion paler; three posterior acrostichals (Bolivia, Surinam).....
- brunnipes* Surcouf.
- Wing deep brown, the second fourth, except behind yellow (Bolivia)....
- pictipennis* Aldrich.
5. Apical cell very wide open, the included costal section more than half as long as preceding one (Costa Rica, Ecuador).....*umbrosa* Aldrich.
- Apical cell less widely opened, included costal section less than half the preceding one.....6.
6. Wing with diffuse and not very strong infuscation (wide spread Neotropical).....*bicolor* (Fabricius).
- Wing with heavy subcostal stripe, beyond middle, before third vein (Brazil).....*batesi* Aldrich.
7. Fourth abdominal segment with discal row of bristles.....8.
- Fourth segment without discals.....13.
8. Femora, pleurae and abdomen blue-green or blackish; 2 pairs of acrostichals before suture.....9.
- Femora, pleurae and base of abdomen yellow.....10.
9. Discal scutellar bristles small, almost in line with the much larger basal lateral pair; female with but one pair of proclinate orbitals, which are almost in the frontal row (Costa Rica).....*uniseta* Aldrich.
- Discal scutellars but little smaller than lateral basal pair, and forming with them a strong curve; female with two pairs of orbitals, just outside frontal row, which is here very hairlike (Peru).....*cruciata* (Townsend).
10. One pair anterior acrostichals.....11.
- No anterior acrostichals.....12.
11. One post humeral (Panama).....*sibialis* Aldrich.
- Two post humerals (South America).....*aeneiventris* (Wiedemann).
12. Mesonotum, rear view, showing three dark stripes, separating four pollinose ones (Brazil).....*purpurata* Aldrich.
- Viewed from behind, the pollen is not distinctly divided into four stripes (Costa Rica).....*semiflava* Aldrich.
13. Facial ridges high and sharp, hairy to middle; middle and hind tibiae not infuscated; sternopleurals 2:1.....*facialis* Aldrich.
- Facial ridges lower, not hairy except close to vibrissae.....14.

14. With one or 2 pairs anterior acrostichals.....15.
Without anterior acrostichals.....17.
15. Legs, pleurae and base of abdomen largely yellow.....16.
Legs, thorax and abdomen blue-green or blackish; fifth sternite of male
produced into two shining black styles (Costa Rica).....
spicata Aldrich.
16. Second to fourth abdominal segments with posterior sharply defined
violet band; third segment without marginal bristles (Brazil).....
cyaneicincta Surcouf.
Second to fourth segments not banded with violet; third segment with
row of marginals (Costa Rica).....*flavicrura* Aldrich.
17. One intra-alar (posterior); abdominal segments 2-4 with sharply defined
posterior violet bands (Brazil).....*pauciseta* Aldrich.
Two intra-alars; abdomen not violet banded.....18.
18. Second abdominal segment with weak hairs along hind margin (South
America).....*randa* (Walker).
Second segment with distinct row of marginals.....19.
19. Mid and hind tibiae black, in male the middle ones elongated and with
minute bristles (South America).....*quadrilineata* (Fabricius).
Mid and hind tibiae not or hardly infuscated; male with the usual bristles
or mid tibia (Brazil).....*dorsimacula* Aldrich.
20. Greatest width of apical cell exceeding length of hind crossvein.....21.
Greatest width of apical cell less than hind crossvein (Brazil).....
peregina Aldrich.
21. Apical cell moderately wide open, the included costal segment not more
than half of preceding one; no acrostichals immediately behind suture
(Mexico to Paraguay).....*bellardiana* Aldrich.
Apical cell very wide open, included costal section more than half of
preceding (Brazil).....*fulvipes* Aldrich.

Tribe **TRIXONEURINI**.

Genus **TRIXONEURA**, new genus.

Genotype.—*Agria fuscipennis* Macquart.

Trixoneura fuscipennis (Macquart).

Agria fuscipennis Macquart, Dipt. Exot., vol. 2, pt. 3, 1841, p. 109.

This tribe, genus and species constitute a very aberrant one for the Calliphoridae. The species, presumably the type specimen (female), was examined by the writer in the Paris Museum, and was found to have the following characters: Arista bare; hairs on upper part of head very stiff and bristly; no sublaterals; one post humeral; post alar declivity with few setae; metasternum with strong hairs; stem vein coarse setose; subcostal sclerite with few setae; first posterior cell closed; no post scutellum. In general appearance the fly is rather small, with something of a Sarcophagid aspect.

Another specimen, also female, was found in the same collection placed with *Toxotarsus rufipalpus* Macquart.

Distribution.—Chile (type locality).

Tribe TOXOTARSINI.

The Toxotarsini appear to be peculiar to South America and are largely restricted to the Andean region. Several genera are known, but in each case they are monotypic. The tribe is characterized by the stem vein being setose above and below; subcostal sclerite setose; squamae bare; a tuft of hairs present in the interior angle of the squamae; parafacials setose; macrochaetae strongly developed on head and thorax; sternopleurals 1:1. In general appearance they resemble the genera *Cynomyia* and *Calliphora*. The group heretofore has been considered under the Sarcophagidae as certain members have the arista plumose only half way. A number of characters such as the presence of only two notopleurals, the post humeral being placed laterad of the presutural and the setose stem vein definitely allies the tribe to the Calliphoridae.

The genus and species, *Chloronesia andina* Townsend,¹ which has also been associated with the genera of this tribe, proves to be a true Sarcophagid.

Toxotarsus rufipalpis Macquart.

Toxotarsus rufipalpis Macquart, Dipt. Exot. Supp., vol. 4, 1851, p. 238, pl. 22, fig. 3.

This genus and species was described by Macquart as having the hind basitarsus arcuated. The writer saw the type in the Paris Museum, but not knowing the character of the hind basitarsus failed to look for it, and took it to be *Sarconesia chlorogaster*. Specimens of *S. chlorogaster*, now before me, males and females, have the hind metatarsus straight. Due to this difference, it seems advisable to consider the two as separate genera and species.

Distribution.—Chile (type locality).

Sarconesia chlorogaster (Wiedemann).

Sarconesia Bigot, An. Soc. Ent. France, ser. 3, vol. 5, 1857, p. 301.

Genotype.—*Sarcophaga chlorogaster* Wiedemann, Aus. Zweifl., vol. 1830, p. 359.

This species bears a strong superficial resemblance to the genus *Sarcophaga* except for its metallic blue abdomen.

Distribution.—Peru, Chile, Argentina, Paraguay.

¹Townsend, Proc. U. S. Nat. Museum, vol. 43, 1912, pp. 360-361.

Chlorobrachycoma splendida Townsend.

Chlorobrachycoma Townsend, Ins. Ins. Mens., vol. 6, 1918, p. 155.

Genotype.—*splendida* Townsend, *ibid*.

Only a single specimen, a female, is known of this genus and species. It is about the size and appearance of *S. chilensis*, but the pollinose mesonotal stripes are less distinct and the metallic greenish blue color is very pronounced.

Distribution.—Oroya, Peru, 12,000 feet (May 8, 1914, C. H. Townsend).

Genus **SARCONESIOPSIS** Townsend.

Sarconesiopsis Townsend, Ins. Ins. Mens., vol. 6, 1918, p. 156.

Genotype.—*Calliphora chilensis* Macquart.

Sarconesiopsis chilensis (Macquart).

Calliphora chilensis Macquart, Dipt. Exot., vol. 2, 1841, p. 131.

? *Cynomyia fuscipennis* Macquart, *ibid*, p. 110.

Musca incerta Walker, Dipt. Saunders, 1856, p. 334.

Sarconesiopsis caerulea Townsend, Ins. Ins. Mens., vol. 6, 1918, p. 156.

Appears to be a common species in Peru and Chile, forty-six specimens at hand. The male has unusually dark wings, while in the female the wings are clear.

Distribution.—Chile (type locality), Peru, Colombia.

NETA, new genus.

Genotype.—*Phryssopoda splendens* Macquart.

Neta splendens (Macquart).

Phryssopoda splendens Macquart, Dipt. Exot., vol. 4, 1851, p. 204.

Calliphora peruviana Macquart, *ibid*, p. 243.

Calliphora magellanica Macquart, Dipt. Exot., vol. 2, 1841, p. 131.

Sarcophaga ortogesa Walker, List, 1849, p. 834.

Musca chilensis Walker, *Nomen nuda*?

Calliphora paytensis Townsend, Ann. New York Acad. Sci., vol. 7, 1892, p. 36.

The types of all the above (Townsend's name was proposed for *peruviana* as it was preoccupied) have been examined by the writer, who found that they constitute but one species.

A very large and striking species, presenting several peculiar characters in the male; that of the single style in place of the four which are usually present, is particularly remarkable.

Distribution.—Bolivia (type locality), Peru, Chile.

Tribe CHRYSOMYINI.

Genus COCHLIOMYIA Townsend.

This genus, at first monotypic (type, *macellaria* Fabricius), had a second species, namely, *Musca laniaria* Wiedmann, assigned to it by Aldrich (1925). A third species, new, has been found in the National Museum collection and is here added.

Key to species of Cochliomyia Townsend.

1. No upper frontal bristles present in male.....2.
A distinct pair of upper frontal bristles present in male; tip of abdomen coppery, the first three tergites very dark green; thorax dark, the four pale stripes more slender than in *macellaria* or *laniaria*, the inner ones scarcely continued onto scutellum (St. Domingo).....*minima*, new species.
2. Tip of abdomen colored the same as the preceding part; thorax evidently metallic blue or green, with four white pollinose stripes, the inner not continued onto scutellum (wide spread throughout warmer parts of America).....*macellaria* (Fabricius).
Tip of abdomen coppery or with violet reflections, in strong contrast to the rather dark preceding portion; thorax black with only slight traces of metallic color, the four white pollinose stripes distinct and the inner pair continued onto scutellum. (Florida, West Indies).....*laniaria* (Wiedemann).

***Cochliomyia minima*, new species.**

Male.—Differs from *macellaria* and *laniaria* by the smaller size; broader front which is one and one-half times the width of parafacial; presence of a distinct pair of upper frontal bristles; the deeply set facial plate which rather sharply rises to the frontal oral margin; the oral vibrissae nearer to the oral margin, being scarcely the length of the second antennal joint above the margin; palpus nearly the length of third antennal joint; the narrower mesonotal stripes (legs very dark brown); dorsum of tergites one, two, three and most of fourth very dark and nearly opaque, the sides of the third and fourth segments with a pollinose spot, on the latter a faint transverse pollinose stripe connects the spots; fifth tergite a fiery copper color; hypopygium and forceps yellowish, the forceps much shorter and stouter and the penis very much longer, its length nearly equal to length of hind tibia; wings subhyaline, darker basally; squamae darkened; halteres brownish yellow.

Female.—Agrees with the male externally except in the front, which is, however, normal for the sex and shows very little difference from the front of the other two species.

Described from two males and one female.

Type locality.—San Francisco Mountains, St. Domingo, West Indies (September 15, A. Busck).

Type.—Cat. No. 28,886, U. S. N. M.

Genus **HEMILUCILIA** Brauer.

Table of Species.

1. Anterior part of thorax more or less yellow; base of abdomen, dorsal view, partly yellow.....2.
 Thorax entirely metallic green or blue; dorsum of abdomen entirely dark.
 Male: Eyes contiguous, no fronto-orbital bristles. Female: Front less than twice as long as wide, black on upper two-thirds. (Brazil, Panama, Costa Rica, Mexico).....*fuscipennis* (Macquart)
2. Second tergite entirely dark. Male: Eyes contiguous, no fronto-orbital bristles. Female: Front more than twice as long as wide, dark only above. (Costa Rica, Panama, Brazil, Paraguay).....
segmentaria (Fabricius).
 Second tergite largely yellow.....3.
3. Male: Eyes separated by width greater than parafacial; upper pair of fronto-orbitals present. Female: Length of front less than twice the width, shining black on upper two-thirds; length 6.5 mm. (Venezuela, Brazil).....*parva*, new species.
 Male: Unknown. Female: Length of front nearly three times its width, black only on vertex; length 8 mm. (Peru).....*townsendia*, new species.

Hemilucilia segmentaria (Fabricius).

A moderate sized species, dark blue, with anterior part of thorax and abdomen yellowish.

Distribution.—Apparently widespread in tropical America. South America (type locality), Brazil, Venezuela, Panama, Costa Rica.

Hemilucilia townsendi, new species.

Less robust than *segmentaria*; thorax metallic green, yellowish anteriorly, with faint pollinose stripes on mesonotum; first and second tergites yellow, the latter with a hind border of dark blue which extends forward as a median stripe to the anterior margin of the tergite; apical half of wing smoky, especially on anterior border.

One female.

Type locality.—Yahuarmayo, Peru (February 11, 1910, C. H. T. Townsend).

Type.—Cat. No. 28,887, U. S. N. M.

Named in honor of Dr. C. H. Tyler Townsend.

Hemilucilia parva, new species.

Noticeably smaller than its congeners, thorax light metallic green, the anterior portion yellowish; first tergite yellow, second yellow anteriorly, darkened on hind border with a median anteriorly directed projection from the darkened portion. Eyes well separated in the male, the upper pair of fronto-orbitals present.

One male, one female.

Type locality.—"Amazon," Brazil (H. W. Bates).

Allotype locality.—Quebrada Secca, Venezuela.

Type.—In British Museum.

Allotype.—Cat. No. 28,888, U. S. N. M.

Hemilucilia fuscipennis (Macquart).

Similar to *segmentaria* but entirely bluish black and lacking the yellow on the thorax and the base of the abdomen dorsally, which, however, may be very obscurely yellow.

Distribution.—Tropical America. Bahia, Brazil (type locality); Panama, Costa Rica, Mexico.

Genus **CHRYSOMYIA** Robineau-Desvoidy.

Chrysomyia desvoidyi Hough.

Only one species, *C. desvoidyi* Hough, is known for this genus in the Western Hemisphere. The genus is essentially an Old World group and is characterized by having the lower squama pilose on the outer half as well as in the basal hollow. *C. desvoidyi* has only the mesal portion of the outer half of the lower squama pilose.

Distribution.—Mexico, Venezuela, Panama, Costa Rica.

Genus **CHLOROPROCTA** Van der Wulp.

Table of Species.

Thorax, except dorsum, and abdomen more or less yellowish; eyes of male with conspicuously enlarged facets above.....*semiviridis* Van der Wulp.
Thorax, etc., entirely dark metallic bluish green; eye facets of male nearly uniform throughout.....*idioidea* R.-Desvoidy.

Chloroprocta semiviridis Van der Wulp.

The two species given in the above key belong to the genus *Chloroprocta* as defined by Aldrich. The yellowish color in *semiviridis* is variable, a female from Costa Rica shows very little trace of yellow.

Distribution.—Yucatan (type locality); Costa Rica; Mexico; Texas.

Chloroprocta idioidea (Robineau-Desvoidy).

Chrysomyia idioidea Robineau-Desvoidy, Myodaires, 1830, p. 445 (type examined).

Musca purpureae Walker, Dipt. Saund., 1856, p. 337 (type examined).

One female from Para, Brazil, and three from Bartica, British Guiana, agree with the types of both *idioidea* and *purpureae*.

Type locality.—South America (for both *idioidea* and *purpureae*).

Genus **PARALUCILIA** Brauer and Bergenstamm.

Table of Species.

Length of antenna much less than height of bucca, or, in female, than width of front. (Southern United States to Argentina and Chile).....
affinis R.-Desvoidy.
 Length of antenna slightly longer than height of bucca and distinctly longer than width of front of female. (Brazil).....*viridula* R.-Desvoidy.

Paralucilia viridula (Robineau-Desvoidy.)

Chrysomyia viridula Robineau-Desvoidy, Myodaires, 1830, p. 445.

Type not seen in the Paris Museum.

One female at hand, which is apparently very distinct from the following species, agrees very closely with the description of *viridula* and is therefore considered to be conspecific with it. In addition to the much narrower front, larger antennae and smaller bucca it possesses the following mesonotal bristles which are absent in *affinis*. Three anterior dorsocentrals (sometimes one in *affinis*); two sublaterals; four posterior dorsocentrals (two in *affinis*).

Distribution.—Brazil (type locality); Sao Paulo, Brazil (A. Lutz).

Paralucilia affinis (Robineau-Desvoidy).

Chrysomyia affinis Robineau-Desvoidy, Myodaires, 1830, p. 445.

Chrysomyia fulvicrura R.-D., *ibid*, p. 446 (type examined).

Calliphora peruviana R.-D., *ibid*, p. 438.

Calliphora fulvipes Macquart,¹ *Diptera Exotique*, vol. 2, pt. 3, 1843, p. 132 . (type? examined).

Lucilia durvillei Macquart, *ibid*, p. 142 (type examined).

Calliphora annulipes Philippi, *Zeitschr. Ges. Naturw.*, vol. 17, 1865, p. 514.

The above list of synonyms is quite sure to be only an incomplete one as it contains only those of which the writer is reasonably certain. Many of the names listed under *Lucilia*, *Chrysomyia* and *Somomyia* in Townsend's catalogue of South American Muscidae will very likely prove to be synonyms of either this species or *Cochliomyia macellaria*.

¹A specimen in the Paris Museum is presumably the type of this species, as it bears a label, "en Cat. du Mus. Gayi." This same specimen, however, bears the name label "*C. rufipes*" which Macquart had previously used for a species he described from Java.

It may be assumed that Macquart at the time of describing it noticed that the name *rufipes* was preoccupied and changed the name to *fulvipes* in the description but did not change the name label on the specimen.

Distribution.—Brazil (type locality) and throughout South America in general and extending into the southern United States.

Tribe PHORMINI.

Phormia regina (Meigen).

Distribution.—Mexico, throughout United States, rather rare in Canada and Alaska.

Protophormia terraenovae (Robineau-Desvoidy).

Distribution.—About the same range as above but more abundant in the North and less numerous southward.

Boreellus atriceps (Zetterstedt).

Boreëllus aristatus Aldrich and Shannon, Ins. Ins. Mens., vol. 11, 1923, p. 107.

Distribution.—Boreal America and Europe.

Genus **PROTOCOLLIPHORA** Hough.

Key to Males of Protophormia.

1. Narrowest width of front equal to length of third antennal joint; outer forceps subquadrate, less than twice as long as broad (*avium*, sens. lat.).....2.
- Narrowest width of front distinctly less than length of third antennal joint; outer forceps elongate, three to four times as long as broad.....3.
2. Hairs on mesonotum one-fourth length of bristles; basicosta black (New York).....variety *avium* S. & D.
- Hairs on mesonotum nearly half as long as bristles; basicosta orange (Washington).....variety *asiovora* S. & D.
3. Parafrontals contiguous (always?).....(*hirudo*, sens. lat.).....4.
- Parafrontals well separated.....(*splendida*, sens. lat.).....5.
4. Three notopleurals (Colorado).....variety *hirudo* S. & D.
- Two notopleurals (Kansas).....variety *parva* S. & D.
5. Dark metallic blue; pollinose stripes on mesonotal disc faint.....6.
- Body with a grayish tinge; pollinose stripes evident on disc of mesonotum (Washington).....subspecies *hirundo* S. & D.
6. Squamae white (throughout U. S.).....variety *splendida* Macquart.
- Squamae darkened (Washington, British Columbia).....variety *hesperia* S. & D.

Key to Females of Protophormia.

1. Large species (11 mm.); parafacials broad, opposite second antennal joint equal in width to distance between oral vibrissae; basicosta dark brown.....(*avium*, sens. lat.).....2.
- Smaller (9 mm. or less); parafacials usually narrower, opposite second antennal joint equal to one-half distance between oral vibrissae; if as broad as in *avium* then basicosta orange.....3.

2. Abdomen slightly pruinose.....variety *avium* S. & D.
Abdomen with ashy tinge.....variety *asiovara* S. & D.
3. Front unusually narrow; upper fronto-orbital absent; three notopleurals....
(*hirudo*, sens. lat.).....4.
Front normal, upper fronto-orbital present; two notopleurals.....
(*splendida*, sens. lat.).....6.
4. General color dark, with rather heavy pruinosity.....5.
General color bronze (Washington).....variety *cuprea* S. & D.
5. Squamae darkened.....variety *hirudo* S. & D.
Squamae white.....variety *parva* S. & D.
6. Abdomen entirely dark blue.....7.
Abdomen more or less coppery.....8.
7. Squamae white.....varieties *sialia* S. & D. and *hirunda* S. & D.
Squamae darkened.....variety *hesperia* S. & D.
8. Body entirely coppery (New Hampshire, Ontario)....variety *aenea* S. & D.
Last abdominal segment only, coppery.....variety *splendida* Macquart.

Tribe LUCILINI

Blepharicnema splendens Macquart.

Synonym.—*Cynomyia auriceps* Walker (type examined).

As far as known, this species has only been taken in Ecuador and Peru.

Genus LUCILIA R.-Desvoidy.

Table of Subgenera and Species of Lucilia, Males.

1. Lower face greatly produced forward; mesonotum with unusually stiff bristles (Galapagos Islands).....
(*Viridinsula*, new subgenus) *Lucilia* (*Viridinsula*) *pionia* (Walker).
Lower face not produced forward.....2.
2. Two sublaterals; arista unusually thick basally and short plumose, the second aristal joint twice as long as broad (Alaska).....
(Subgenus *Francilia* Shannon) *Lucilia* (*Francilia*) *alaskensis* Shannon.
Three sublaterals; arista normal and long plumose, the second joint as broad as long.....(Subgenus *Lucilia*) R.-Desvoidy).....3.
3. Three posterior acrostichals; propleura black setose; occiput partly black setose.....4.
Two posterior acrostichals.....7.
4. Palpi and basicosta yellow.....5.
Palpi blackish; basicosta black (North America, Europe).....
sylvarum (Meigen).
5. Parafrontals contiguous; pruinosity of body scarcely perceptible (Idaho).....
thatuna, new species. Parafrontals well separated; body with distinct pruinosity.....6.
6. Body usually more evidently green; metasternum pilose; lobes of fifth sternite inconspicuous, appressed, with short stiff hairs. (Cosmopolitan).....
sericata (Meigen).

- Body usually more evidently coppery; metasternum bare; lobes of fifth sternite prominent with dense long hairs. (Cosmopolitan.) (*argyri-cephala* Macquart; *pallescens* Shannon) *cuprina* (Wiedemann).
7. Subcostal sclerite setose; back of head mostly black setose; basicosta black; propleura black setose (North America, i. e., boreal and transitional zones and high altitudes in southern states) *caesar* (Linnaeus).
Subcostal sclerite faintly pubescent 8.
8. Hind margin of second and third and entire surface of fourth tergites with long, erect bristles; back of head entirely with stiff black setae; propleural pile and basicosta black; lobes of fifth sternite conspicuous (Washington) *elongata* Shannon.
Abdomen not conspicuously bristly; back of head with pale soft pile 9.
9. Parafrontals bristly only on lower half, contiguous and of less width than parafacial; propleura pale pilose; basicosta dark brown 10.
Parafrontals bristly on more than lower half 11.
10. Eye facets, on large front area, greatly enlarged; parafrontals reduced to slender line of less width than one of adjoining facets; pro- and metathoracic spiracles greatly enlarged; general body color purplish; squamae darkened. (Costa Rica, Mexico) *ocularis*, new species.
Eye facets moderately enlarged; parafrontals distinctly broader than width of facet; thoracic spiracles moderately enlarged; general body color dark bluish green; squamae moderately infuscated
rica, new species.
11. Propleura black pilose; parafrontals contiguous, bristly on entire length, a pair of upper frontal bristles present; basicosta dark brown; forceps with short sparse pile. (Texas, New Mexico, Arizona)
unicolor Townsend.
Propleura pale pilose 12.
12. Parafrontals bristly on lower three-fourths, no upper frontals present; basicosta dark brown; forceps with rather dense long pile 13.
Parafrontals with a pair of upper frontal bristles; inner forceps not distinctly hairy 14.
13. Face very sparsely pilose; general color strongly purple. (Peru)
ibis, new species.
Face normally pilose; general color strongly green. (Texas, Mexico, Costa Rica, Panama) *hirtiforceps*, new species.
14. Parafrontals contiguous; beard black; basicosta more or less yellow. (Southeastern United States) *australis* Townsend.
Parafrontals distinctly separated; beard largely yellowish; basicosta yellow. (Southeastern United States and West Indies)
cluvia (Walker).

Table of Females of Lucilia.

1. Two sublaterals; two exterior bristles on fore tibia. (Subgenus *Fran-cilia*) *alaskensis* Shannon.
Three sublaterals; one exterior bristle. (Subgenus *Lucilia*) 2.
2. Three posterior acrostichals 3.

- Two posterior acrostichals 6.
3. Basicosta black; palpi brownish.....*sybarum* (Meigen).
Basicosta and palpi yellow..... 4.
4. Body without evident pruinosity; third antennal joint broader than width of parafacial.....*thatuna*, new species.
Body with distinct pruinosity; parafacial broader than width of third antennal joint..... 5.
5. Body more evidently green; metasternum pilose.....*sericata* (Meigen).
Body more evidently coppery; metasternum bare.....*cuprina* (Wiedemann).
6. Subcostal sclerite setose; basicosta black.....*caesar* (Linnaeus).
Subcostal sclerite faintly pubescent..... 7.
7. Tergites three, four and five with strong, erect bristles; basicosta black; back of head entirely black setose.....*elongata* Shannon.
8. Tergites three, four and five not conspicuously bristly..... 9.
9. Propleura black pilose; basicosta dark brown; front and face dark.....
unicolor Townsend.
- Propleura pale pilose..... 10.
10. Antennae bright reddish yellow (Santa Marta, Colombia).....
ruficornis Macquart.
- Antennae not bright reddish yellow..... 11.
11. Bases of wings strongly darkened; body color purplish.....
ocularis, new species.
- Bases of wings not strongly darkened..... 12.
12. Beard largely pale..... 13.
Beard entirely black..... 14.
13. Front as broad as length of third antennal joint.....*cluvia* (Walker).
Front not as broad as length of third joint.....*rica*, new species.
14. Basicosta more or less yellow.....*australis* Townsend.
Basicosta dark brown (Face yellowish. Contrast with face dark in *unicolor*).....*hirtiforceps*, new species.

VIRIDINSULA, new subgenus.

Genotype.—*Lucilia pionia* Walker.

This new subgenus is known only in the male and the genotype has only been recorded from the Galapagos Islands.

Subgenus **LUCILIA** R.-Desvoidy.

Lucilia cuprina (Wiedemann).

This species has been recorded from America under the names *Lucilia pallescens* Shannon and *Lucilia argyricephala* Macquart (Shannon, Proc. Ent. Soc. Washington, 1925). Recently Patton (Bull. Ent. Research, 1925) has shown that *argyricephala* Macquart is synonymous with *cuprina* (Wiedemann).

Evidently *L. cuprina* is well established as a cosmopolitan species. It is apparently indigenous to Southern Asia and

parts of Africa. Specimens in the National Collection are from Michigan, District of Columbia, North Carolina, Texas, Brazil, Hawaii, Australia, Asia and Africa.

***Lucilia thatuna*, new species.**

Male and female.—Parafrontals of male contiguous; front of female of moderate width; three posterior acrostichals; back of head partly black setose; propleura black setose; palpi and basicosta yellow; pruinosity of body barely perceptible.

Two males, three females.

Type locality.—Moscow Mountains, Idaho (July 20, 1924, J. M. Aldrich).

Type.—Male, Cat. No. 28,889, U. S. N. M.

***Lucilia oculatis*, new species.**

Male and female.—Fairly large species of a deep purplish color and characterized by an area of very large facets, particularly in the male, on a large frontal portion of the eye. Parafrontals of male contiguous and greatly reduced so that at their narrowest portion the two together appear to be a slender line of less width than one of the adjoining facets and setose only on lower half; propleura pale pilose; two posterior acrostichals; pro- and metathoracic spiracles greatly enlarged; bases of wings and squamae darkened.

Three males, two females.

Type locality.—Higuito, San Mateo, Costa Rica (Pablo Schild).

Allotype locality.—Juan Vinas, Costa Rica (Pablo Schild); also from Mexico (J. R. Inda).

Type.—Cat. No. 28,890, U. S. N. M.

***Lucilia rica*, new species.**

Male and female.—Rather small species with eyes facets and thoracic spiracles moderately enlarged, general body color bluish green; parafrontals of male bristly only on lower half and their combined width at the narrowest portion distinctly broader than width of adjoining eye facet; hind region of lower surface of head pale pilose; two posterior acrostichals; squamae moderately infuscated. Front of female not as broad as length of third antennal joint.

Two males, three females.

Type and allotype localities.—Antigua, West Indies (1924, H. Goodwin); also one paratype from Mayaguez, Porto Rico (March 14, 1914, R. H. Van Zwahlenburg).

Type.—Cat. No. 29,145, U. S. N. M.

***Lucilia ibis*, new species.**

Male.—Rather small species of a deep purplish color. The very sparsely pilose face and the rather densely and long haired forceps serve to identify it.

Two males.

Type locality.—Huadquina, 5,000 feet, Peru (August, 1911, Yale Peruvian Expedition).

Type.—Cat. No. 28,891, U. S. N. M.

***Lucilia hirtiforceps*, new species.**

Male and female.—Closely allied to *L. australis* and *unicolor*. A moderate sized species of a deep green coloration; parafrontals of male subcontiguous, setose on lower three-fourths and without a pair of upper frontal bristles; face yellowish; two posterior acrostichals; propleura pale pilose; basicosta dark brown.

Five males, six females. Type male and allotype female taken in copula.

Type locality.—Ancon, Canal Zone (June 1, 1921, J. Zetek); also from Taboga Island, Panama; Costa Rica; San Salvador; Colima, Mexico; Victoria, Texas.

Type.—Cat. No. 28,892, U. S. N. M.

***Lucilia cluvia* (Walker).**

Synonym.—*Lucilia pilatei* Hough.

The synonymy is based upon an examination of the type made by the writer in the British Museum. A fairly common species in the West Indies and southeastern United States.

***Lucilia unicolor* Townsend.**

Synonym.—*Lucilia infuscata* Townsend.

In the writer's previous treatment of the Luciliini (1924) this species was stated to be possibly distinct from *australis* Townsend. Additional material now shows it to be a different species.

Table of Species of Cynomyia.

Head as high as broad and mostly bright orange yellow (east and west coasts of northern North America).....*mortuorum* (Linnaeus).
Head broader than high, largely blackish, lower portion partly reddish brown (throughout North America).....*cadaverina* R.-Desvoidy.

***Cynomyia flavipalpis* Macquart.**

This species was described from America and reported from New Hampshire by Johnson (determination by Coquillett). It may prove to be a species of *Steringomyia*. Species not seen.

Table of Species of *Steringomyia* and *Calliphora*.

1. Two sublaterals; two intra-laterals; males with lobes of fifth sternite prominent, obtusely rounded apically. (See note below on *S. montana*).....2.
- Three sublaterals.....4.
2. Squamae white.....3.
- Squamae darkened (Colorado, 10,240 feet altitude; Alaska).....*S. aldrichi* Shannon.
3. Arista short plumose (Alaska).....*S. popoffana* (Townsend).
- Arista with normal plumosity (Colorado, 10,240 feet altitude; Alaska).....*S. alpina* (Zetterstedt).
4. Front of head largely bright golden; squamae white; basicosta yellow; two costal spines; front of male broad with pair of upper frontals (plains region of western North America).....*C. elongata* (Hough).
- Front of head not conspicuously bright yellow; squamae darkened.....5.
5. A strongly differentiated pair of secondary ocellars placed immediately behind ocelli; bristles on facial ridges well developed; front of male broad, the parafrontals with strong, long bristles on entire length. (Western North America).....*latifrons* Hough.
- Secondary ocellars hardly differentiated from surrounding hairs; facial ridge bristles much smaller.....6.
6. Two intra-alars.....7.
- Three intra-alars.....13.
7. Bucca red; basicosta yellow, or yellowish-brown. (Very wide spread in North America).....*C. erythrocephala* (Meigen).
- Bucca black; basicosta black.....8.
8. Head as broad as high; gena (below parafacial) normally black.....9.
- Head broader than high; gena reddish brown.....10.
9. Distance between wing margin and angle of fourth vein less than preangular section of fourth vein; forceps of male very similar to those of *C. viridescens* (Alaska).....*C. morticia* Shannon.
- Distance between wing margin and angle of fourth vein greater than preangular section of fourth vein.....9a.
- 9a. Forceps of male broadly pear-shaped in outline.....*S. alaskensis* Shannon.
- Forceps of male distinctly more slender, similar to those of *S. aldrichi*.....*Steringomyia montana*, new species.
10. Bases of wings blackish.....11.
- Bases of wings not strongly darkened.....12.
11. Male: Narrowest width of front equal to distance between hind ocelli. Female: Width of parafacial about equal to length of arisal rays (Mexico, Colombia?) (Synonym.—*C. irazuana* Townsend).....*C. nigribasis* Macquart.
- Male: Narrowest width of front distinctly wider than distance between hind ocelli. Female: Width of parafacial much greater than length of arisal rays (Peru).....*C. peruviana* R.-Desvoidy.
12. Beard reddish (North America).....*vomitaria vomitaria* (Linnaeus).
- Beard black (northern North America).....*vomitaria nigribarba* Shannon.

13. Bucca red; third antennal joint of female rather small, the length equal to distance between rows of frontal bristles (western United States)....
coloradensis Hough.
 Bucca black; third antennal joint of female rather large, the length greater than distance between rows of frontals (eastern and northern North America)*viridescens* R.-Desvoidy.

***Steringomyia montana*, new species.**

Male and female.—This species is intermediate between the genera *Calliphora* and *Steringomyia*. It seems to be closely related to *C. morticia* on the one hand and to *S. alaskensis* (also an intermediate form between the two genera) and *S. aldrichi* on the other. The genitalia of the males of *montana* and *alaskensis*, including the prominent lobes of the fifth tergite, are more typically those of *Steringomyia* and the difference in the wing venation, as stated in the key and which appears to be characteristic of *Steringomyia*, is shared by both. For these reasons *montana* and *alaskensis* are retained in *Steringomyia*, even though they possess three sublaterals. The differences between the species are very slight especially in the females. Two females at hand from the same locality as the male of *montana* are here considered to belong to the same species as the male, but one female from Alaska and two from Mount Ranier, Washington, may be either *montana* or *alaskensis* and for the time being are not assigned to either species. The forceps of the male show distinct differences. In *alaskensis* the four together present a broad pear-shaped outline. In *montana* they are much slenderer and very similar to those of *aldrichi* (see figures in Shannon's paper, 1923).

One male, two females.

Type and allotype locality.—Edmonton, Alberta (August 19, 1923, E. H. Strickland).

Type.—Cat. No. 28,895, U. S. N. M.

Tribe POLLENINI.

Two North American genera are included in the Pollenini: *Pollenia* Desvoidy and *Melanodexia* Williston.

The tribe Pollenini differs considerably from the other North American Calliphoridae. The species are without metallic blue or green coloration, but usually have a dull grayish or blackish appearance, the abdomen sometimes is shining black but usually has a pollinose checkered pattern similar to that of the Sarcophagidae. Facial carina usually present; antennae rather small; facialae distinctly convergent below; oral vibrissae approximated and situated well above oral margin; posthumeral bristle variable, may be absent (*Melanodexia*) or present and placed laterad, in line with or mesad of the presutural; sternopleurals 1:1; metasternum, prosternum and propleurae bare; parafacials hairy down to lowermost margin of eye; squamal disc bare; tympanic membrane bare.

Two genera of the Sarcophagidae, *Morinia* Desvoidy (European) and *Neophyto* Townsend (North American) seem to possess considerable in common with the Polleniini.

Genus **POLLENIA** Desvoidy.

Four species of *Pollenia* (including *Nitellia*) have been reported from North America. Of these, only *P. rudis* (Fabricius) seems to be well known and established in this country. *Pollenia* (*Nitellia*) *glabricula* (Bigot), described from California, has not been recorded since it was first described. An examination of the type may show it to belong to the genus *Melanodexia*. *Pollenia obscura* Bigot, described from North America, likewise has not been recorded since its original discovery.

Pollenia vespillo Fabricius.

Pollenia (*Nitellia*) *vespillo* (Fabricius), a well-known European species, has been reported from Nova Scotia by Walker and its occurrence in North America was confirmed by Hough. Aside from these records nothing is known of this species in America. It may be immediately distinguished from *P. rudis* by the almost entirely shining black abdomen, only a very faint and uniform pollinosity being present.

Pollenia rudis (Fabricius).

P. rudis (Fabricius), commonly called the cluster fly because of its habit of congregating in attics during the winter, may be easily recognized in its fresh condition by the presence of the loose yellow pile on the sides and dorsum of the thorax. This pile is deciduous and in a rubbed condition the species may be mistaken for a Sarcophagid. However, the family and tribal characters noted above serve to separate it from the Sarcophagidae.

A very common species in eastern North America. Specimens in the National Collection are also from Colorado, Nevada, Utah and California.

Genus **MELANODEXIA** Williston.

Three species of *Melanodexia* are recognized in the present paper based on a study of twenty males and six females. The differences between the species are rather slight and, moreover, the specimens show some individual variation which further complicates their separation. All of the material is from California and Oregon. Nothing is known of their biology.

The species described by Bigot as *Nitellia glabricula* from California may well prove to be a species of this genus.

Key to Species of Melanodexia.

A1. Males.

- B1. Forceps small, length of outside forcep equal to combined width of the four; third antennal joint distinctly narrower than second; size moderate.....*satanica*, new species.
- B2. Forceps elongate, length of outside forceps distinctly longer than combined width of the four; third antennal joint about as broad as second.
 - C1. Palpus not longer than antenna; size moderate, 8 to 9 mm.....*tristis* Williston.
 - C2. Palpus distinctly longer than antenna; larger species, 11 mm.....*grandis*, new species.

A2. Females.

- B1. Frontal vitta parallel sided; palpus not longer than proboscis.....*tristis* Williston.
- B2. Frontal vitta diverging downwards; palpus distinctly longer than antenna.....*grandis*, new species.

Melanodexia tristis Williston.

Description based on type male.

Male.—Head nearly hemispherical, a little broader than high; front black, at narrowest width a little broader than length of third antennal joint, widening out considerably above antennae, swollen in appearance; frontal and ocellar bristles long and slender, about length of arista; first and second joints shining brown; second enlarged and with a long dorsal bristle equal to length of antenna; third joint dark brown, twice as long as wide; arista longer than antenna, with two irregular dorsal rows of rays and a lower row, the outer fourth bare; face large, swollen; facial ridges converging below; vibrissae long, placed well above oral margin; facial carina distinct; distance between lower margin of eye and oral margin equal to width of eye; palpi slender, brownish, with scattered long setae. Thorax shining black, bristles long slender, with fairly long black hairs interspersed (the type specimen has a single pair of anterior acrostichals; two pairs are normal number). Legs not elongate, the bristles rather long, pulvilli and claws of rather large size (said to be small in original description). Abdomen short-conical, with distinct bristles only on distal part, anteriorly with abundant erect hairs. Third longitudinal vein strongly convex in front, terminating very near tip of wing; antepenultimate section of fourth vein fully twice length of penultimate section, the latter joining the ultimate section at an angle. Wings and squamae smoky. Length, 6 mm.

This was very kindly loaned me by the University of Kansas.

Female.¹—Description based on specimens at hand.

¹The female described as allotype by Williston can not be found in the Kansas University collection. From the description it appears to belong to the species described below as *grandis*.

More shining black than the male but still with a decided pollinose cast; the thoracic and abdominal hairs less developed, rather short on the abdomen; front rather broad; frontal vitta with parallel sides; facial carina scarcely perceptible, the antennae consequently nearly touching basally; palpus shorter than proboscis; length equal to that of the male.

Type locality.—Death Valley, California (Baron, collector).

Type.—In Kansas University collection.

Specimens in the National Museum from San Bernardino County (May, D. W. Coquillett); San Diego (March 27, 1915, April 20, 1921, W. S. Wright); Claremont (C. F. Baker; Metz).

There are also three males and one female from Oregon in the collection which may be referable to this species, but some variation is present in these and they have been kept apart for the time being. They appear to be intermediate between *tristis* and *grandis*.

Melanodexia grandis, new species.

Male and female.—This species may be separated from *tristis* by its larger size; head higher than broad; palpus longer than antenna; the longer forceps of the male and broader front of the female in which the frontal vitta widens downwards. Length, 11 mm.; wing, 8.5 mm.

Four males, two females. All from California.

Type locality.—Monterey County, California (July 5, 1896, collector ?).

Other localities.—Pacific Grove (May 9, 1906, J. M. Aldrich); Pleyto, Monterey County (May 22, 1920, E. P. Van Duzee).

Type.—Cat. No. 28,894, U. S. N. M.

Melanodexia satanica, new species.

Male.—About the size of *tristis*; the wings a little more smoky; second antennal joint enlarged and perceptibly broader than third joint; palpus longer than antenna; forceps short, outer forceps only as long as combined width of the four and rather strongly contracted beyond middle but moderately expanded at apex to form a blunt point (sharp-pointed in *tristis* and *grandis*). Length, 9–10 mm.; wing, 8–8.5 mm.

Eight males.

Type locality.—Los Gatos Canyon Divide to mouth of Mount Diablo Ridge, Fresno County, California (June 6–8, 1907, J. C. Bradley).

Type.—Cat. No. 28,893, U. S. N. M.

Two females are at hand from Bairs Ranch, Humboldt County, California (June 9, H. S. Barber) which may prove to belong to this species. They differ from the females of *tristis* and *grandis* principally by their striking shining black coloration. There is also a possibility that they represent

the species described as *Nitellia glabricula* Bigot from a single female from California. This species was described as being shining black.

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A FOREIGN CABBAGE FLEA-BEETLE IN THE UNITED STATES.

BY F. H. CHITTENDEN, U. S. Bureau of Entomology.

March 7, 1921, Mr. R. L. Michaud, Rochester, N. Y., wrote for information as to how to dispose of what he termed a "black flea" which was destroying seedling radish. May 7, specimens were furnished which proved to be a *Phyllotreta* not hitherto known as occurring in this country. In regard to the habits of the species, he wrote: "The beetles work hardest when the sun is hot and just as soon as the seed comes through the ground they eat it. All my cabbage is ruined and completely gone. They hide in the ground at night and on cold days. They are attacking not only radish and cabbage but turnip and everything of the cabbage family and last summer when there was nothing like that to feed on they attacked wax beans." Our correspondent found it necessary to dig up his beds for replanting. He stated that the insects did not appear to injure plantings after the middle of August and that this was the third season that they had "cleaned up" in his vicinity. Others who grew radish in the neighborhood experienced the same trouble.

The specimens of the seedling radish plants received showed that the insects at first attacked the cotyledons, pitting them with holes in the customary manner of flea-beetles, and afterward attacked the smaller first leaves as they developed. Injury of this character showed practically complete destruction of the plants attacked. Later in the same year Dr. D. E. Fink visited the infested region and obtained additional specimens of the beetles and their work and made observations on local conditions. The species at that time appeared to be confined to within a few miles of Rochester.

Recently, specimens of this *Phyllotreta* were forwarded to Mr. F. Heikertinger, specialist on the *Halticini* of Europe, who prepared specimens of the male genitalia for positive identification. Under date of January 4, 1926, he wrote that the species is surely the European *Phyllotreta aerea* Allard, a form which inhabits southern Europe and the southern portions of middle Europe and which is now and then destructive to cruciferous crop plants, such as cabbage, although it is not a common species like *atra* and *cruciferae*. Specimens have also been taken in Europe on a hedge mustard, *Sisymbrium altissimum*.

Ph. aerea belongs to a unicolorous group in which the antennal joints are alike in the sexes. Since this adds another species introduced from abroad, the others being *armoraciae* and *vitata*, it is pertinent to remark that it is quite possible that any or all of the Eurasian *Phyllotretas* might be introduced and become more or less injurious in the course of years. Of the related species there are the following:

Ph. nigripes Fab., larger and distinctly green in color. The commonest of the dark species occurring on cultivated and wild Cruciferae in Germany and Austria.

Ph. cruciferae Goeze, not quite so large as the preceding, metallic blue-green or less distinctly dark green. Very common, widely distributed and destructive to cruciferous crops in Europe.

Ph. atra Fab., a little larger than *aerea* but quite similar, also very common, injurious and widely known in Europe.

Ph. diademata Foudr., of similar size to *aerea*, occurring on *Radicula silvestris* and *Neslia paniculata*, both naturalized from Europe. Apparently not injurious.

Ph. austriaca Hktr., a comparatively rare species occurring on *Sisymbrium strictitissimum* in Austria.

Ph. consobrina Curt., an inhabitant of western Europe, is similar to *aerea* only in the female, the male being easily separated by the fourth and fifth antennal joints being equally dilated. This species is also destructive to cole crops.

Mr. H. S. Barber has called the writer's attention to the receipt of a specimen of *Ph. nemorum* L. taken at Chicago, Ill., in a package from Germany, November 27, 1925. This is

one of the best known of the destructive European species and might in all probability be introduced here as easily as was the case of the injurious *Ph. armoraciae* Koch, which is practically and fortunately restricted in its food habits, injuring so far as known only horse-radish.

The following is a technical description of *Ph. aerea*:

Phyllotreta aerea Allard.

Phyllotreta aerea Allard, Ann. Soc. Ent. France, 1859, Bul. p. C. Heikertinger, Halticinae, Käfer d. Deutsch. Reiches, IV, 1913, p. 177.

Phyllotreta punctulata Foudras, Ann. Soc. Linn. Lyon, ser. 2, 1859-1860, pp. 255-257.

Elongate oval, not more than twice as wide as long, moderately convex, rather feebly polished black, with rather faint metallic, more or less aeneous, lustre. Antennae very slender, slightly more than half as long as the body, first three basal joints as viewed from lower surface light yellowish red. Head narrow, surface distinctly, very finely, and somewhat densely punctulate; eyes rather large and prominent. Prothorax moderately convex, long, nearly one-third wider than long, feebly narrowed, a little wider at the apex than the head, moderately arcuate at the sides, widest near the middle, feebly narrowed at the base; surface finely, regularly, and sparsely punctate. Elytra wide, distinctly wider at the base than the prothorax, humeri abruptly rounded, umbone not prominent, sides moderately and evenly arcuate, punctation about as on the prothorax, finer at the apex. Ventral segments shining black, finely, rather densely punctulate, punctules with very fine, sparse gray hairs only. Femora black, faintly pilose with gray; tibiae piceous, brown at articulations; tarsi pale fuscous.

Male.—Antennal joints 2, 3, 4 subequal in length; 2 slightly wider than 3; 3 slightly shorter; 5 about one-fourth longer than 4 or 6; 7 scarcely wider; 8-11 a little wider than preceding, scarcely more than twice as wide as 2, 3, 4; subequal in length, 11 a little longer. Fifth ventral segment subtruncate, transversely concave across the middle, not flat but with a ridge at the apex, tubercles wanting or rather indefinitely indicated.

Female.—Antennae about as in the male. Fifth ventral segment feebly concave at sides, apex conical without tubercles.

Length 1.4-2.2 mm.; width 0.7-1.1 mm.

Habitat.—Rochester, N. Y. (R. L. Michaud, D. E. Fink); Southern and South-central Europe.

Ph. aerea is not closely related to any described native form. From any other species with which it might be confused, it may be distinguished by its more perfectly oval and by the distinctive last ventral segment of the male. Compared with our common *pusilla*, the prothorax is wider and the color is not distinctly cupreous or aeneous as in that species. The eyes are prominent, the humeri abruptly rounded, and the ventral punctules bear fine gray hairs.

A FOSSIL ORTHOPTEROUS INSECT FORMERLY REFERRED TO
MECOPTERA.

BY T. D. A. COCKERELL.

Taphacris bittaciformis (Cockerell).*Eobanksia bittaciformis* Cockerell, Amer. Journ. Science, XXVII (1909), p. 384.

When Dr. R. J. Tillyard recently visited me in Boulder, we had a very enjoyable session going over some of the fossil insects from Florissant, and among others, the type of *Eobanksia* came up for review. I had not studied it since 1909, but on taking it up again it at once occurred to me that it was Orthopterous. Dr. Tillyard, from his intimate knowledge of insect pterology, at once confirmed this suspicion, and made the suggestion that it represented a single hind wing, instead of a pair of wings as supposed. He also declared it Acridiid, and considered it referable to *Taphacris* of Scudder, the type of which (*T. reliquata* Scudder) is almost twice as large. I had specimens of *Taphacris* in the collection, and we proceeded to make comparisons, at once finding a close similarity. Since Dr. Tillyard left, I have minutely examined the specimens, and can confirm his opinions. The attempted restoration originally offered (l. c. fig. 9, A) is of course radically wrong, yet it shows the essential features of the venation and can be understood if, instead of making the outline of two wings, the apparent upper wing is connected with the supposed lower, and it is understood that the broad fan-like lower portion has been lost. The notations Sc, R, Rs, M and Cu stand; Cu runs into the first anal as Snodgrass figures for *Dissosteira carolina*, but very much nearer the base of the wing. The parallel veins marked R in the supposed hind wing are A3 and A4. The costal vein begins below the costal margin, but soon attains it as can be seen in recent species. The obliquity of the cross-veins above A3 and below A4 is a striking feature.

The second specimen referred to (l. c. fig. 8 and fig. 9B) shows a hind wing completely folded, the first fold at the beginning of the anals, as in Martynov's recent figure of *Locusta (Pacyhtylus) migratoria*. The veins are darker than in the type; the two branches of the radial sector are about 1.7 mm. apart (3.4 apart in the type), and the distal branch is again forked (simple in the type). Dr. Tillyard thinks this is a distinct species, and I was inclined to agree; but in view of the great variation shown in the venation of Orthoptera (even on the two sides of the same specimen) I will merely designate it as a new variety, *T. bittaciformis tillyardi*. The type is at the University of Colorado; the reverse at Yale. So far, I have not found any closely related recent genus.

NOTES ON HYPOCHAETA AND RELATED GENERA OF MUSCOID FLIES (DIPTERA).

BY J. M. ALDRICH.

Since I discussed *Hypochaeta longicornis* of Coquillett 1897 (these Proceedings, vol. 25, 1923, 161, 162) I have been permitted to examine the type of *Frivaldskia longicornis* Schiner, the European species which Coquillett believed he had recognized from North America. In the article cited I assumed that our species is different from that of Schiner, but later I had some misgivings on the point. Through the liberality of the authorities of the Vienna Natural History Museum in allowing me to borrow Schiner's type, I am able to clear up some relations, and the discoveries should be put on record.

First a few words on the nomenclatural confusion about this European species, which has been increased by the publication of Stein's fine posthumous work on European Tachinidae.

Schiner proposed the genus *Frivaldskia* to replace *Fallenia* Meigen, preoccupied (1861, 142); in a list of Tachinidae he merely wrote, "*Frivaldskia* (*Fallenia* Mg.)," but later (1862, 527) he gave characters for the genus. Now *Fallenia* Meigen (1838, 265) was based on two species, *Tachina longicornis* Fallen and *Tachina coracina* Meigen. Coquillett (1910, 544) designated the former as type, and it automatically becomes the type of *Frivaldskia* also.

Brauer and Bergenstamm (1889, 93), recognizing the fact that Schiner's *longicornis* was not the same as Fallen's established the genus *Hypochaeta*, with the sole species "*longicornis* Schiner (non Fall.)."

Thus *Tachina longicornis* Fallen became the type of *Frivaldskia*, and *Frivaldskia longicornis* Schiner became the type of *Hypochaeta*. Stein (1900, 135) ascertained from Meigen's type that Schiner's species is a synonym of *Tachina distincta* Meigen (1824, 302), which becomes the prior name for the type of *Hypochaeta*.

Bezzi (1907, 305) places under the name *Frivaldskia* (used as a subgenus of *Campylochaeta*), only the two species *longicornis* Fallen and *distincta* Meigen (syn. *longicornis* Schiner); he makes *Hypochaeta* a synonym of *Frivaldskia*.

Stein (1924, 104) puts under *Frivaldskia* only the one species *distincta* Meigen, with *longicornis* Schiner as synonym; and believing *longicornis* Fallen to be distinct generically he erects for it the new genus *Latigena*. Here are evidently two errors, as he should have used *Frivaldskia* for the latter and *Hypochaeta* for the former—assuming that the two species are generically distinct, which seems probable (I have not seen *longicornis* Fallen, but it has proclinate ocellars).

Hypochaeta distincta Meigen, as represented by Schiner's type of *longicornis*, shows the following characters of special interest besides those mentioned by Brauer and Bergenstamm:

Female.—Back of head with white hair except the orbital row, which is double above, and a group of black hairs at lower part of cheek; the bristle of the cheek is smaller than figured by Brauer, who overestimated its taxonomic value. It is the same as in our *tarsalis*. Palpi yellow.

Acrostichal 3, 2(?); dorsocentral 2, 3; humeral 4; posthumeral 1; presutural 2 (inner small); notopleural 2; supraalar 3 (only the middle one large); intraalar 3; postalar 2; sternopleural 2, 1 (lower anterior hairlike); pteropleural 0; infrascapular hairs absent; scutellum with 2 lateral, 1 good sized decussate apical, 1 small discal. Squamae white, of ordinary form. Hypopleural bristles well developed, 5 or 6.

First posterior cell ending a little farther before the tip of the wing than in our *tarsalis*; the distance from tip of fourth vein to apex is very little less than from auxiliary to first on costa. Last section of fifth vein to preceding as 20 to 24 by micrometer. Third vein at base with half a dozen hairs, two or three of which are of very unusual size.

Front tarsi not at all notched underneath. Front tibia with two outer bristles and row of large on front (extensor); middle tibia with 3 bristles and some hairs on outer front side; hind tibia with 8 very uneven short and long bristles on outer hind side; hind trochanter with a medium sized bristle.

There are four genera which form a very compact group, hardly more than a genus in fact, characterized by having hairy eyes; bristly facial ridges; receding face; third antennal joint several times the second; ocellars large, erect, the tips reclinate and diverging; first posterior cell ending near tip of wing; smallish size and general gray color. Three are American, only *Hypochaeta* being European. Only five species are included. They may all be readily tabulated as follows:

Key to Hypochaeta and Allied Genera.

1. First vein hairy.....2.
First vein bare.....3.
2. Hind crossvein retracted, so that the last section of the fifth vein is considerably more than half the preceding (North America).....
Chaetophlepsis Townsend.
Hind crossvein not retracted, hence the last section of fifth vein is much less than half the preceding (North America).....
Parahypochaeta Brauer and Bergenstamm.
3. Hind crossvein retracted (Europe).....
Hypochaeta Brauer and Bergenstamm.
Hind crossvein not retracted (Peru).....*Hypochaetopsis* Townsend.

Parahypochaeta Brauer and Bergenstamm (1891, 337) has only the one species *heteroneura*. I have reported on the type (1924, 215), and no other specimens are yet known.

Chaetophleps Townsend (1915, 422) has two species; *tarsalis* Townsend (ibid.) from North and South America, is gray, while *townsendi* Smith (1916, 94) has red legs and abdomen.

Hypochaetopsis Townsend (1915, 422) has only one species, *chaetosa* Townsend (ibid.).

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SOME RECENT GENERIC DERIVATIVES OF THE MALLOPHAGAN GENUS PHILOPTERUS NITZSCH (PHILOPTERIDAE).

By H. E. EWING, U. S. Bureau of Entomology.

The genus *Philopterus* Nitzsch, like a few other genera of the order Mallophaga, has long included a vast assemblage of species that infest hosts of almost all the larger bird groups. In recent years various genera have been split off from the old cosmopolitan group, and in 1916 Cummings established at one time four new genera for certain of its components. But even with these various subtractions the genus yet includes upward of two hundred valid species.

THE PHILOPTERI OF OWLS.

Osborn (1896) pointed out that his *Philopterus bubonis* of the great horned owl, *Bubo virginianus virginianus*, showed "decided affinities to *ceblebrachys*" and approached *Nirmus*, particularly in the form of the head and in the rigidity of the trabeculae. Mjöberg (1910) was the first to separate any of the owl-infesting species into a separate taxonomic group. In this year he established his subgenus *Strigiphilus*, which has been rightly raised to a genus by Harrison (1916), for the peculiar owl-infesting species, *Philopterus heterocerus*

Nitzsch. Into this genus Harrison (1916) places two other owl-infesting species, *Philopterus hexophthalmus* Nitzsch and *Philopterus remotus* Kellogg and Chapman. That this genus is very distinctive in that the males have appendiculate antennae and that the genital armature is peculiar is at once admitted. In the shape of the head *Strigiphilus* species approach *Philopterus ceblebrachys* Nitzsch, to be further considered.

Kellogg (1913) pointed out that the owl-infesting Philopteri group themselves about three well differentiated types represented by Nitzsch's three species, *P. rostratus*, *P. cursor* and *P. ceblebrachys*. If Mjöberg's subgenus is excluded from consideration this undoubtedly is the case as far as our present knowledge of the different species goes. Cummings (1916) followed Kellogg in recognizing the latter's three types of owl-infesting Philopteri, and gave us for the first time a detailed account of the genital armature of the species typifying the three groups.

Kellogg believed that much of the variation found among the owl Philopteri was of the individual type brought about "probably through the unusual isolation of the separate groups of individuals that compose the species."

Cummings (1916) admitted the distinctness of the three types of owl Philopteri, but believed a close relationship existed between these types and the hawk-infesting Philopteri in their male copulatory apparatus.

Up to the present only nineteen species of Philopteri (exclusive of the three species of *Strigiphilus*) have been described from owls as type hosts, and of these Harrison (1916) recognizes as valid only thirteen. These thirteen species are represented by only eight type host species, which fall into as many genera.

Thus out of about a hundred owl species known from the entire world, representing about a fourth as many genera, only a small percentage of their lice has been studied and described. Because of this paucity of knowledge concerning the Mallophaga of owls as a group much hesitation is felt in making generalizations of any kind. However, the writer would like to summarize what is known regarding the distinctness of the three types of owl-infesting Philopteri mentioned by Kellogg and by Cummings, and also give a suggestion or two in regard to the possible significance of the group differentiation observed.

The most distinctive group of the three is the *ceblebrachys* group. In *ceblebrachys* itself the forehead is greatly shortened, the sides being rounded; the trabeculae are short and immovable, and do not reach the tip of segment one of the antenna; the eyes are reduced and the cornea lacks the uniform curve found in typical Philopteri; the male genital armature shows a long slender basal plate, fused endomeres and short, stubby, free parameres.

P. cursor, typifying the *cursor* group of owl-infesting Philopteri, has the forehead more or less quadrangular, of medium length, with the sides broadly incurved (concave); the trabeculae are of medium size, longer than segment one of antenna, and movable; the eyes are normal with evenly rounded corners; the male reproductive organs are similar to those of *ceblebrachys* except, as pointed out by Cummings, the vesicula seminalis is very large and rather peculiarly shaped.

P. rostratus, representing the *rostratus* group of owl-infesting Philopteri, is similar to *cursor* except that the forehead is much longer and the vesicula seminalis is much smaller and differently shaped.

In regard to the significance of these different types a note should be given. After studying many species of Philopteri infesting birds other than owls, it appears to the writer that in two of the three mentioned groups, the *cursor* group and the *rostratus* group, there are no characters that would differentiate these from the great body of Philopteri left in Nitzsch's old genus after subtracting Cumming's genera, *Anatoecus*, *Ibidoecus*, *Neophiloater* and *Dollabella*. More than this, these two groups run together completely in the shape of the head; and even in the types of male genital armature we have an intermediate type in *P. syrnii* Packard.

In the *ceblebrachys* group conditions are different. In the shape of the head, the reduction in size of the trabeculae and their fusion with the head and in the reduction of the eyes there exists a combination of characters that sets apart these species from all other Philopteri.

The writer believes that in the *ceblebrachys* group there has been a parallel phylogenetic development of the parasites with their hosts. It is probable that the members of this group have been longest isolated on the owls, hence have to a much greater degree adapted themselves in response to the environment imposed upon them by their owl hosts. Could not the degeneration of the eyes, most noted in *bubonis* Osborn, be explained through adaptive responsiveness to the nocturnal habits of the host in conjunction with their avoidance of bright light in the daytime? The eyes being practically useless in the night or in the dark places during the daytime, may have degenerated just as they have in many cave-dwelling insects. However, with their hosts, the owls, that are compelled to seek out free-living prey widely scattered over the land side the eyes have become acutely sharpened in their function. Do we not have here, therefore, a remarkable case of a physical element of an environment (darkness) working in opposite directions in its modification effect upon a specialized organ of similar function common to both host and parasite,—a subtle difference caused by the diversity of the food and other habits of the two?

Because of the viewpoint of the present writer in regard to the *ceblebrachys* group the liberty is here taken of establishing a new genus for it.

EUSTRIGIPHILUS, new genus.

Forehead irregularly rounded, broader than long and with sides outwardly rounded; signatural plate undivided and extending forward almost to the front margin of head; clypeal bands well pigmented and extending to the margin of head. Trabeculae reduced and immovable, not reaching the tip of the first segment of antenna. Eyes small and with distorted corneas. Antennae the same in the two sexes; short; segments one and two of about the same length. Abdomen broad, stout. Male genital armature with long basal plate, fused endomeres, and short, stubby, free parameres; a true penis wanting.

Genotype.—*Philopterus ceblebrachys* (Nitzsch).

Contained species.—In addition to the type species, *Philopterus bubonis* (Osborn) and *Philopterus clypeatus* (Mjöberg).

The type species shows the extreme diversification from the typical Philopteri. In *P. bubonis* the forehead is not so well rounded. The same is even more true of *P. clypeatus*. In addition, the last mentioned species has much larger trabeculae than those of the type species. Doubtless other species will be added to this genus in the future.

THE PHILOPTERI OF CUCKOOS.

Four species of cuckoo-infesting Philopteri contained in the National Museum Collection have been studied. All of these show a clypeal region which is characteristic, having an expanded hyaline margin with the front part incurved and a tuft of three or more long setae on top of each clypeal band. Among the bird hosts cuckoos are held to occupy a rather isolated and primitive position. It is interesting to note, therefore, that some of their Philopteri have a distinctive appearance. A new genus is here established for certain cuckoo-infesting species.

CUCULOECUS, new genus.

Clypeal region with a hyaline margin throughout, which in front is incurved or concave; signatural plate entire; clypeal bands not reaching the lateral margins of the head and each bearing dorsally at its anterior end a tuft of three or more long setae. Trabeculae very large and movable. Antennae medium and similar in the two sexes. Eyes normal with evenly rounded corneas. Abdomen broad and stout; tergites of female interrupted in the middle. Genital armature of male with slender basal plate; parameres stout, free, incurved; endomeres fused into an endomeral plate which usually protrudes beyond the parameres; penis present, but small and not well developed.

Genotype.—*Philopterus coccygi* (Osborn).

Contained species.—In addition to the type species, *P. latifrons* (Nitzsch), and two other undescribed species, one from a Cuban cuckoo and one from a Chinese cuckoo.

Cumming's Genera.

The genera established by Cummings (1916) are quite distinctive. These four genera, the two new ones established in this paper and Mjöberg's owl-infesting genus are separated from each other in the following key.

Key to Seven of the Generic Derivatives of Philopterus Nitzsch.

1. Clypeal region expanded, with free margin hyaline throughout, in front incurved, or emarginate, and bearing above on each lateral chitination (clypeal band) a tuft of three or more long setae. Parasitic on cuckoos.
Cuculoecus, new genus.
- Clypeal region without such characters.....2.
2. Clypeal region expanded and with hyaline free margin throughout but rounded and not emarginate in front; antennae very short. Parasitic on geese, ducks and swans.....*Anatoecus* Cummings.
- Clypeal region but little if at all expanded, not evenly rounded and not bounded throughout by a hyaline margin.....3.
3. Antennae of males appendiculate, or having a lateral process; forehead short; broader than long. Parasitic on owls.....*Strigiphilus* Mjöberg.
- Antennae of males not appendiculate, but the same as those of females.....4.
4. Forehead irregularly rounded, much broader than long and with sides out-curved; trabeculae reduced, immovable, and not reaching the distal end of first antennal segment; eyes reduced. Only found on owls.....
Eustrigiphilus, new genus.
- Forehead more or less rectangular with sides broadly emarginate (concave); trabeculae larger and usually movable; eyes with rounded hyaline corneas.....5.
5. Signatural plate divided; antennae long, with segment two distinctly longer than any of the others. Parasitic on ibises.....*Ibidoecus* Cummings.
- Signatural plate not divided; antennae shorter.....6.
6. Tergites of females interrupted dorsally. Parasitic on storks.....
Neophilopterus Cummings.
- Tergites of females extending across the abdomen and uniting the pleurites of the two sides. Parasitic on *Numenius* species.....
Dollabella Cummings.

THE PHILOPTERI OF BIRDS OF PREY.

Cummings (1916) calls attention to the similarity of the male genital armature of the Philopteri of owls to those of the birds of prey. Undoubtedly there is a rather marked similarity between the two. It should be noted, however, that whereas the genital armature of the owl-infesting species shows the penis either vestigial or wanting, it is present, though small, in the birds-of-prey type. Also in the Philopteri of birds of prey the

endomerer are not united distally, hence a true endomerer plate is wanting.

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DIESTRAMMENA OCCURRING IN WELLS (ORTHOPTERA: TETTIGONIDAE).

BY A. N. CAUDELL, *U. S. Bureau of Entomology.*

In December, 1923, a letter was received from Mr. W. M. Wallace of Carterville, Illinois, saying his well was infested with crickets. These insects had first been noted by him the previous spring when numbers of them were seen to jump down into the water when the lid of the well was raised. Little was thought of the matter until they began to multiply in numbers. It was then decided to draw all the water out of the well, which was done twice during the summer and again in the fall, each time the walls of brick being washed. "And now," the letter states, "we have a well full of water and bugs." As many as five young ones are sometimes drawn up in one bucket of water; and he surmised that the eggs of the crickets must have been deposited in the crevices of the bricks. A specimen was sent for determination and proved to be *Diestrammena japonica* Blatchley. This insect has hitherto been found only in green houses, except for a single specimen taken in Kansas under a sidewalk and near a green house. Thus this occurrence in such numbers in a well, especially in the winter, is of decided interest.

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THREE NEW TERMITOPHILOUS BEETLES FROM BRITISH
GUIANA.

BY W. M. MANN, *U. S. National Museum, Washington, D. C.*

A number of years ago Dr. Alfred Emerson sent me a large series of termitophiles which he collected in British Guiana. Only a small portion of these interesting beetles have been worked up. The following paper deals with descriptions of three of the new forms,

PODUROIDES, new genus.

Small, tapering little depressed species, with the pronotum and elytra somewhat expanded and thin at sides. Head nearly as broad as anterior border of pronotum, transversely oval, occipital angles rounded; in front of eyes obliquely receding. Eyes well developed, moderately convex. Clypeus transverse, straight at anterior border. Labrum transverse, feebly emarginate at middle of front, rounded at sides. Maxillae with outer lobe long and slender, inner lobe shorter and strongly setose on inner border. Maxillary palpi 4-jointed; second joint nearly as long as the third, slender basally and clavate at apex, third joint strongly enlarged, terminal joint slender, acuminate. Ligula elongate, excised apically to form two conical lobes. Labial palpi 3-jointed, first joint elongate, second transverse, third a little longer than the second and half as thick. Mandibles stout, acuminate, finely toothed near middle, prostheca elongate, well developed. Antennae 11-jointed, stout, basal joint broad and concave above, second joint broader than the third. Pronotum convex. Elytra moderately convex, strongly transverse. Abdomen evenly tapering, seven segments visible from above. Legs short, femora and tibiae rather strongly compressed, coxae contiguous, tarsi 4-4-4 jointed.

Genotype.—*Poduroides bövingi*, new species.

Poduroides bövingi, new species.

Length 1.25 mm.

Reddish brown, elytra, and antennae except the terminal joint, a little darker than the rest, terminal and penultimate joints of antennae yellow. Head and body finely punctate and covered with moderately abundant yellow pile which is exceedingly fine and short on the dorsum and longer on ventral surface of abdomen; brown, rather stiff, though fine, erect hairs sparse on head, thorax and elytra, more abundant on gaster where there are also sparse, fine, long, suberect yellow hairs; legs pilose; antennae very finely setose.

Head nearly twice as broad as long, vertex transversely convex, front flat,

clypeal region flat. Diameter of eyes greater than their distance to posterior border of head. Antennae about as long as head and thorax together, basal joint broader than the others, strongly depressed, with the upper surface distinctly concave; second joint transverse, the remainder forming a club, tapering at apex, joints 3-9 strongly transverse, 10 less than twice as broad as long, 11 connate, longer than broad but shorter than 9 and 10 together.

Pronotum convex, a little broader than long and a little broader behind than in front, anterior angles broadly and posterior more narrowly rounded, sides feebly arcuate, anterior border straight, posterior border arcuate at middle, concealing the scutellum. Elytra a little broader than pronotum and together more than twice as broad as long, broadest in front of middle, behind which the sides are nearly straight, anterior corners rounded, posterior corners subangulate, posterior margin nearly straight. Abdomen tapering, a little longer than head, thorax and elytra together.

Type locality.—Kartabo Point, British Guiana.

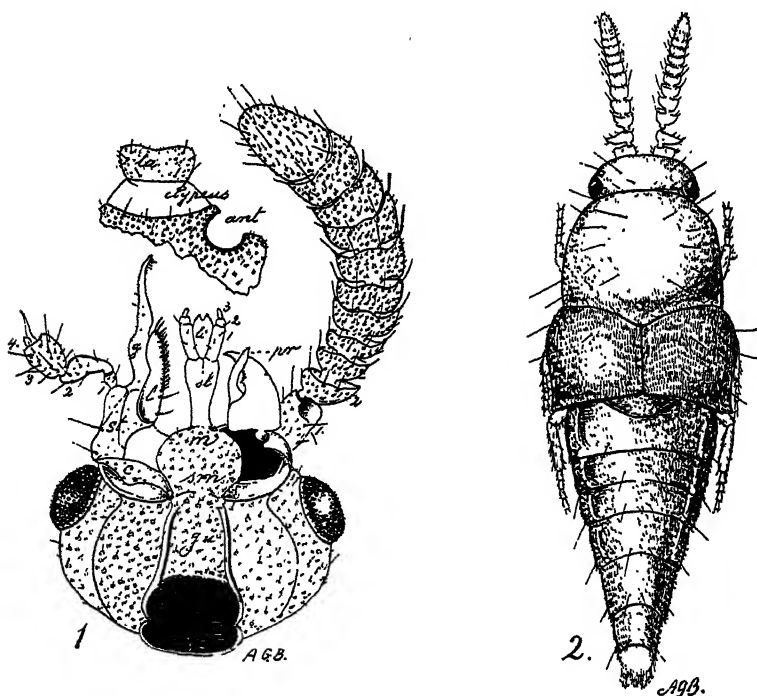


Fig. 1. *Poduroides bövingi* Mann. Head of adult, ventra view (ant.=antennal ring; c=cardo; g=galea; gu=gula; l=lacinia; la=labrum; li=ligula; m=mentum; pr=prostheca; sl=stipes labii; sm=submentum; st=stipes.

Fig. 2. *P. bövingi* Mann. Adult, dorsal view.

Host.—*Nasutitermes* (*Nasutitermes*) *gaigei* Emerson.

Type and paratype.—Cat. No. 29061 U. S. N. M.

Described from three specimens under Emerson number 163j; the type on a tag, one paratype on a slide, the other paratype in alcohol.

This genus from tarsal formula and structure of trophi belongs near the Corotocini, but is very distinct from the genera in that group in the structure of the antennae. The strongly sloping front of head, concealed by the broad, basal antennal joints makes it necessary to dissect the specimen to see even the form of the clypeus.

The habitus sketch and that of the details of the head were kindly drawn by Dr. Böving, to whom, in recognition of his studies in beetle anatomy, I dedicate the species.

Subfamily TACHYPORINAE.

TERMITONICUS new genus.

Body depressed, broadest at elytra and base of abdomen, tapering behind. Head small, not concealed, much narrower than pronotum, subovate, surface flattened in front, convex behind, posterior border biconcave. Labrum transverse, convex, rounded at anterior border. Maxillary palpi small, second and third joints subequal in length and thickness, the second clavate and curved, the third subcylindrical, terminal joint thick and very short. Mandible stout basally, slender and acuminate at tip. Labial palpi 3-jointed, basal joint thick, second and third joints subequal. Ligula long, slender, bifid, the tips conical. Antennae 11-jointed, slender, only slightly thickened toward apex, longer than head and thorax, not geniculate, all joints longer than broad. Eyes well developed. Pronotum broad, convex, the sides arcuately expanded as thin lamellae. Elytra very broad, with median portion convex and sides broadly expanded. Abdomen broad basally, evenly narrowed behind, in profile thickest in front of middle, more convex above than beneath; sides broadly margined, the marginal line distinctly impressed but very narrow; 7 segments visible. Legs short, femora flattened, tibiae slender, tarsi 4-4-4 jointed, basitarsi not longer than second joint; coxae approximate.

Genotype.—*Termitonicus mahout*, new species.

Termitonicus mahout, new species.

Length 1.75 mm.

Dark reddish brown, shining; sparsely, finely and shallowly punctate. Brownish erect hairs sparse on thorax, elytra and antennae, absent on head, except labrum, and on legs except a pair on anterior trochanters; abdomen with exceedingly fine, short, recumbent yellow pubescence.

Head a little longer than broad, front flat, vertex convex, sides behind eyes evenly arcuate to posterior border; clypeus short, truncate anteriorly. Eyes moderately convex, shorter than their distance to occipital angles. First antennal joint about as long as second and third joints together, rather slender, its apex twice as broad as the base, second joint two-thirds as long as the third,

remaining joints longer than broad, decreasing in length toward apex, terminal joint conical, shorter than the two preceding together.

Pronotum more than two times as broad as head, anterior border emarginate; sides, anterior and posterior angles strongly arcuate, posterior border at middle broadly rounded. Elytra individually much broader than long, together nearly twice as broad as pronotum, sides arcuate, posterior corners subangulate, border broadly emarginate. Abdomen at base nearly as wide as elytra, sides convergent, nearly straight.

Type locality.—Kartabo, British Guiana (Emerson).

Host.—*Nasutitermes* (*Velocitermes*) *beebei* Emerson.

Type and paratypes.—Cat. No. 29062 U. S. N. M.

Described from four tag-mounted specimens (one type) and one slide-mounted specimen taken by Dr. Emerson, and bearing his number 389. Dr. Emerson has prepared a figure of the species to publish with notes on its biology.

Termitoniscus, from the position of the antennal insertions, the structure of the thorax, with the spiracles exposed, and the arrangement of the coxae, comes in the Tachyporinae, but can be assigned to none of the known groups, the 4-jointed tarsi not conforming to those characters of other groups than the Hypocypti and the 11-jointed antennae separating it from that group.

The depressed and broad triangular abdomen, the form of the expanded pronotum and elytra are distinctive.

Tribe BOLITROCHARINI.

Group *Leptusae*.

TERMITOSPECTRUM, new genus.

Small, robust species, somewhat resembling *Philoterme*, with pronotum expanded laterally and moderately physogastric. Head depressed, excluding labrum, transverse, broad posteriorly, the front and vertex shallowly concave. Labrum longer than broad and narrowly rounded at anterior margin, surface convex. Mentum quadrangular, submentum long and narrow. Ligula projecting as an elongate, simple, subcylindrical process. Labial palpi 3-jointed, second joint shorter and very slightly broader than the third, which is about two times as long as broad.

Mandibles slender, arcuate, simple. Maxillae with outer lobe very long and slender, slightly thickened apically.

Maxillary palpi 4-jointed, first joint very small, second slender at basal half, clavate anteriorly, about half as thick as the third which is elongate-oval and a little longer than the second, fourth small, subulate. Antennal fossae small. Antennae 11-jointed, basal joint thickly ovate, shorter than second and third joints together, second joint distinctly longer than broad, constricted at base, joints 3-10 submoniliform, those on the basal half less rounded than those apically, terminal joint ovate, shorter than joints 9-10 together.

Eyes large, convex.

Pronotum transverse, sides produced laterally as broad, very thin lamellae, robust and strongly convex above and concave beneath, separated from the discal portion by heavy diagonal furrows, posterior border narrowly lamellate. Elytra distinctly narrower than thorax, together much broader than long, humeri subgibbous, sides feebly arcuate, posterior angles narrowly rounded, posterior border strongly emarginate. Scutellum short and broad. Abdomen a little wider than pronotum, broadest basally, narrowed and rounded apically, sides arcuate, convex above and strongly convex beneath, roundly margined at sides, carried elevated. Mesosternum finely carinate between coxae, posterior margin projecting and rounded between metasternal coxae.

Legs rather stout, femora and middle and posterior tibiae moderately compressed. Tarsi 4-4-5 jointed, basitarsi shorter than the other joints together.

Genotype.—*Termitospectrum ihoracicum*, new species.

***Termitospectrum thoracicum*, new species.**

Length 1.60 mm.

Pale reddish brown, front of head, margins of pronotum, tips of elytra and the appendages yellow-brown. Head, thorax and elytra shallowly cribrate-punctate. Hairs yellow in color, on dorsal surface sparse, on front of head more abundant, fine and erect, on ventral surface and appendages abundant, longer and coarser.

Head broadly rounded at sides posterior to eyes, the hind border fitting the deeply emarginate anterior border of pronotum. Pronotum about twice as broad as head, excluding eyes, anterior angles of margin produced as rounded lobes and separated from the remainder of margin by a shallow, oblique impression.

Type locality.—Kartabo Point, Kartabo, British Guiana.

Type.—Cat. No. 29063 U. S. N. M.

Host.—*Nasutitermes* (*Nasutitermes*) *gaigei* Emerson.

There is some superficial resemblance to the genus *Philotermes*, but *Termitospectrum* is distinct from this genus in the structure of the pronotum, the greatly elongate labrum, its moniliform antennae and tapering abdomen.

Described from two specimens, the type bearing A. Emerson number 163j and definitely associated with the above host; the paratype under Emerson number 390 and believed to be associated with the same host but found in a nest which was secondarily used by *Nasutitermes gaigei* and *Nasutitermes beebei* Emerson.

NOTES ON CERATOPOGONINAE (DIPTERA).

BY WM. A. HOFFMAN.¹

Taxonomists interested in the Chironomidae have never been certain as to what the genus *Ceratopogon* actually represented. Edwards (1) (Ann. and Mag. Nat. Hist., Ser. 9, Vol. VI: 127, 1920) has outlined the various concepts held by investigators in this field. Through inquiry Edwards established the fact that Meigen's type *C. communis* possessed affinities with both *Atrichopogon* and *Stilobezzia*. He later informed me that a personal examination demonstrated that a microscopical pubescence was present on the eyes, and therefore *Psilohelea* Kieffer was synonymous with *Ceratopogon*. Among a number of Ceratopogoninae sent me by Dr. Felt of Albany, New York, was included a series, the characters of whose members coincided in the main with descriptions of Edwards (1), Winnertz (2), Kieffer (3) and Goetghebuer (4), the species concerned having been placed under *Ceratopogon* (*Psilohelea*). Since no American ceratopogonine has as yet been definitely classed as a species of *Ceratopogon* as limited by Edwards and the above-mentioned workers, this form, apparently new, is described in order that it may serve as a basis for comparison.

***Ceratopogon culicoidithorax*, new species.**

Length of body (dry specimen) approximately 2 mm.; length of wing 1.32 mm.; width of wing .69 mm.

Occiput black, surface dull, covered with a fine gray pruinescence; frons hour glass shaped, decidedly narrowed between the bases of the antennae; clypeus slightly shiny; proboscis much more so, and slightly shorter. Palpi five segmented, the apical one longest, third proportionately shorter than in *Culicoides* and *Leptoconops*. The distance between the inner margins of the eyes is about one-seventh the head width. The antennae are short, dark yellowish brown, segments four to ten inclusive approximately spherical, the apical five becoming progressively longer, though the length of the terminal member does not exceed its width by more than a third. Surface of thorax brownish black, shiny, with fine grayish pruinescence; hairs few in number, black and coarse, restricted chiefly to the areas near the wing bases and the margins of the prescutellar depression. Ovate sensory organs on the fore part of the mesonotum are a prominent feature as with *Culicoides*, though possibly more shallow. Surface of scutellum and metanotum similar to that of mesonotum, the former with two pairs of coarse black hairs, one median, the other lateral, also several minute ones, all arranged in a transverse row. Greater portion of haltere pale except the light brown base. Legs well developed, tibiae especially so, of a medium brown shade, tarsi lighter; the tibiae tend to be more heavily clothed with long coarse hairs; the second and third

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tibiae lack spines, the first terminated by a spur; the last has the usual apical row of spinulae; metatarsus not quite equal to combined length of following two segments, fourth very small, obcordate; metatarsus with four pairs of small spines ventrally, first two of these heavier, second segment with a terminal pair, posterior metatarsus with a number of ventral spinulae; claws dark, strong, almost as long as fifth tarsal segment, each with an inconspicuous tooth about midway from the base; an extremely minute empodium may be seen under favorable conditions. Wing practically devoid of macrotrichiae; veins R_{1+2+3} and R_{4+5} (first and second longitudinal) are exceptionally well developed, rising above the surface; radial cells approximately equal in length, the second considerably wider, its distal end not quite attaining a point two-thirds of the wing length from the base; Cu forks directly below the median end of the radio-median crossvein. Abdomen dull brown, with few brown hairs, chiefly situated laterally.

Male similar to the female except in regard to the usual secondary sexual characters; in the female the radial cells are practically contiguous while in the male they are separated by a distance almost equal to the length of each, this result apparently having been brought about by coalescence of the radial veins in the apical portion of the first cell and the basal part of the second; these cells are therefore shorter than the same structures in the female. The claw of the male is shorter and lacks the median tooth.

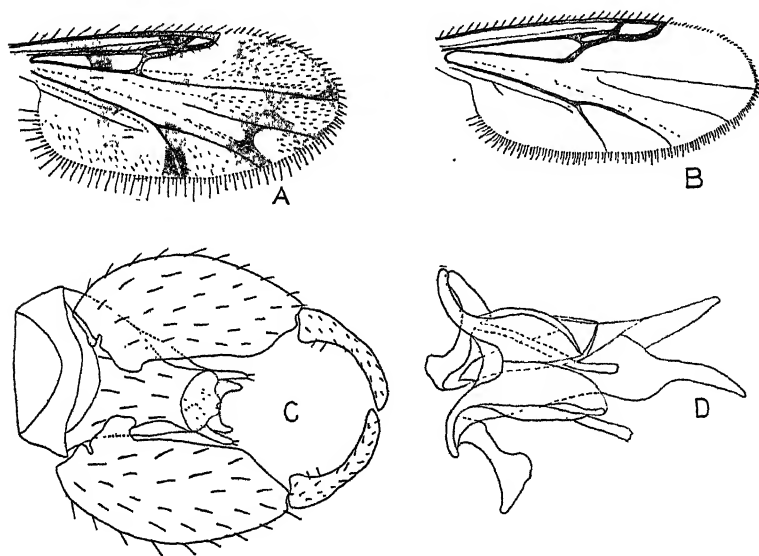


Fig. A. *Culicoides mississippiensis*. Wing.

Fig. B. *Ceratopogon culicoidithorax*. Wing.

Fig. C. *Ceratopogon culicoidithorax*. Male hypopygium; side pieces, claspers, and ninth tergite: ventral view.

Fig. D. *C. culicoidithorax*. Male hypopygium, harpes and aedeagus: ventral view.

Karner, N. Y., May 14, 1906. Eight cotypes, 6 ♀ ♀. 1 ♂ in the New York State Museum at Albany, 1 ♀ in the U. S. National Museum. Cat. No. 29423.

The presence of prominent sensory thoracic organs suggests that *Ceratopogon* may be closely allied to *Culicoides*, while the radial cells markedly resemble those of *Stilobezzia*. The larva of *Stilobezzia coquilleti* Kief (*picta* Coq.) can not be distinguished from *Culicoides*, at least under the lower powers of a binocular. The larva of this species, however, is quiescent, while those species of *Culicoides* in which the larvae have an aquatic existence, move in an active vibratory manner.

***Culicoides mississippiensis*, new species.**

Length (dry specimen) approximately 1.5 mm.; length of wing 1.4 mm.; width of wing .62 mm.

Frons, clypeus and antennae light brown, palpi darker, third segment long gradually widening up to three-fourths its length; proboscis blackish brown, shiny; fourth segment of antennae slightly shorter than fifth; occiput brown, densely covered with gray pruinescence, with a number of short brown hairs. Inner margins of eyes almost contiguous at vertex. Thorax brown, densely covered with gray pruinescence, with a number of short hairs,—those in and bounding the prescutellar depression and at the wing bases considerably longer. Sensory organs crescent shaped, inner end wider. Scutellum similar to mesonotum except for a darker median patch. Stem of haltere yellowish, button chiefly brown. Legs long, yellowish brown, first tarsal segment more than twice the length of second. Wings white, with a tendency toward the formation of three brownish bands, the first midway between the radio-median crossvein and the base, disappearing at vein M, visible again below Cu, then gradually becoming fainter. The second crosses the middle of the wing in a similar manner; the third begins beyond the second radial cell, irregularly across the wing, giving off branches to the tip along veins M1, M2 and the first branch of Cu and along the anterior margin. These surround three large apical white spots. Microtrichiae occur on the distal half and the anal portion. Abdomen dull brown, covered with fine gray pruinescence, with a few long hairs; the second to seventh segments inclusive are lighter along the posterior margin. The sensory organs in these segments are very prominent; they consist of a basal anterior pair widely separated and a posterior pair located medially.

Pass Christian, Miss., April, 1925 (Mrs. J. Michels): "troublesome." Eight female cotypes in the collection of the U. S. National Museum. Cat. No. 29206.

Attention is called to a typographical error occurring in the synoptic key of the American species of *Culicoides* (Amer. Journ. Hygiene, 5:278, 1925). The first portion of couplet 16

should refer to *C. stellifer*, the second to couplet 17 instead of the reverse. Since the appearance of this paper some additional distributional records have been obtained. *C. venustus* Hoff. known heretofore only from Baltimore was taken at Nassau, N. Y., June 22, 1907. A specimen of *C. stellifer* Coq. from Speculator, June 8, 1911, also represents a new record from New York. Occurrence of an individual of *C. melleus* Coq. collected with the type series of *C. mississippiensis* at Pass Christian, Miss., indicates that like *C. furens* Poey this form is apparently restricted to coasts and inlets. Other localities for this species are Lake Worth, Florida (type), and South River, Maryland, June 2, 1923.

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THE APHIDS OF MYZOCALLIS INFESTING THE BAMBOO.

By ROYICHI TAKAHASHI, *Department of Agriculture, Research Institute, Taihoku, Formosa, Japan.*

At present seven species of *Myzocallis* are known to occur on the bamboo (*Bambusa*, *Arundinaria*, *Dendrocalamus* and *Sasa*).

Myzocallis arundinariae Essig.

Univ. Calif. Publ. Entom., 1, p. 302 (1917).

Host.—*Bambusa*, *Arundinaria*.

Distribution.—Japan, North America.

Myzocallis arundicolens Clarke.

Canad. Entom., xxxv, p. 249 (1903).

Synonym.—*Takecallis bambusae* Matsumura, Jl. Coll. Agr. Sapporo, vii, p. 373 (1917).

Host.—*Bambusa*, *Arundinaria*, *Sasa*.

Distribution.—Japan, North America, England.

Myzocallis bambusifoliae Takah.

Aphididae of Formosa, part 1, p. 73 (1921), part 2, p. 123, pl. II, B, fig. 6 (1923) and part 3, p. 63 (1924).

Host.—*Bambusa*.

Distribution.—Formosa.

***Myzocallis formosanus* Takah.**

Aphididae of Formosa, part 3, p. 64 (1924).

Host.—*Arundinaria*.

Distribution.—Formosa: Arisan (altitude about 8,000 feet).

***Myzocallis sasae* Mats.**

Jl. Coll. Agr. Sapporo, VII, p. 372 (1917).

Host.—*Sasa*, *Bambusa*.

Distribution.—Japan.

***Myzocallis taiwanus*, new species.**

The aphid recorded as *Myzocallis sasae* Mats.? in my paper (Aphididae of Formosa, part 4, p. 46) is not true *sasae* Mats., but is hitherto undescribed.

Winged viviparous female.—Green, without stripes and patches on the dorsum. Head and thorax slightly brownish. The 3d antennal joint black on the apical part and slightly dusky on the basal part; the 4th black on the distal half; the 5th and 6th black. Cornicles somewhat dusky. Body oblong. Head a little protruding at the middle of the front above the front ocellus, between the antennae (near the front) with a pair of very small tubercles each bearing a fine hair which is much shorter than the 2d antennal joint, wanting hairs on the dorsal side. Eyes large, with moderate ocular tubercles. Frontal tubercles absent. Antennae slender, provided with a few very short setae; the 3d joint somewhat imbricated on the distal portion, provided with 4–7 oval sensoria of medium size arranged in a single row on the basal one-third which is somewhat dilated and almost as stout as the front tibia; the 4th imbricated, lacking sensoria; the relative length of joints about as follows: III—122, IV—80, V—70, VI—80 (42+38). Rostrum short, reaching a little beyond the front coxae. The 1st oblique on the front wing slightly curved; the 2d distinctly curved at the middle; the 3d twice branched, the upper branch extending to the apex of the wing; stigmatic vein faint, moderately curved; hind wings with 2 somewhat divergent obliques; hooklets 2. Thorax and abdomen almost lacking hairs. Abdomen at the middle of the basal part of the dorsum with 2 pairs of blunt tubercles which are larger than the cornicle, conical in shape, almost as long as wide at midlength and each bearing a short bristle at the apex; a few similar, but smaller tubercles present near the side. Cornicles small, constricted at the middle, expanded at the base, wider than long, much smaller than the cauda. Cauda a little shorter than the distal part of the 6th antennal joint, wider than the lobe of the anal plate, constricted, with many long bristles of which one pair is longer and stouter. Anal plate deeply bilobed, provided with some very long bristles. Legs slender; tibiae

provided with numerous rather long setae; front tibiae almost as long as the 3d antennal joint; hind tarsi somewhat shorter than the cauda.

Length of body—about 2.0 mm. Antenna—about 1.8 mm. Fore wing—about 2.5 mm.

Host.—*Bambusa*, attacking the young leaf and shoot.

Distribution.—Formosa (Taiwan): Taihoku, Karenko.

Type.—In Research Institute collection, Taihoku, Formosa.

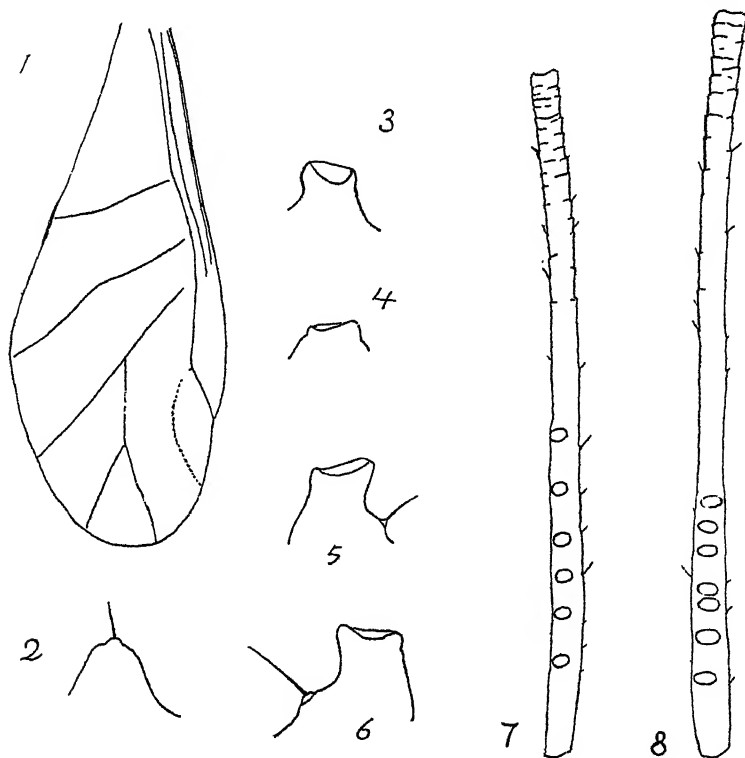


Fig. 1. Fore wing of *M. taiwanus* Takah.

Fig. 2. Tubercle on the abdomen of *M. taiwanus* Takah.

Fig. 3. Cornicle of *M. taiwanus* Takah.

Fig. 4. Cornicle of *M. formosanus* Takah.

Fig. 5. Cornicle of *M. bambusifoliae* Takah.

Fig. 6. Cornicle of *M. bambusicola* Takah.

Fig. 7. 3d antennal joint of *M. sasae* Mats.

Fig. 8. 3d antennal joint of *M. taiwanus* Takah.

This species is very closely allied to *M. sasae* Mats., but is different from it in the shape and distribution of the sensoria on

Attelabus (Himatolabus) constrictipennis, new species.

Shining black throughout, glabrous on dorsum, convex, about one-fourth longer than wide; elytra strongly constricted behind the base. Rostrum as long as the head, moderately widened at the apex, subcylindrical; surface distinctly, somewhat sparsely punctate. Eyes circular in outline, somewhat closely placed together, strongly carinate between, with a corresponding deep sulcus each side. Head with an impressed line in posterior half; surface feebly and very sparsely punctulate. Antennal joints 1 to 4 subequal in length; 1 and 2 very thick, subequal in width, 2 arcuate on one side; 3 and 4 very slender; 7 and 8 subequal in length and width; club a little longer than preceding four joints, first joint of club only a little wider than long. Prothorax about as long as wide, a little wider at apex than the head, sides feebly arcuate, gradually widened to base, which is sinuate; disc moderately constricted at apex, strongly transversely foveate at base, fovea transversely rugose; surface uneven, with a circular depression near the middle of the disc on each side, feebly, finely, and very sparsely punctate, densely in the fovea. Scutellum large, almost one-third wider than long, nearly impunctate. Elytra about as wide as long, much wider at base than prothorax, strongly sinuate, humeri slightly produced, gradually rounded and, with the umbone, elevated, laterally compressed and very prominent, sides nearly straight, apex narrower, subtruncate; strongly constricted about one-third behind the base, constriction not reaching the umbone; surface strongly and coarsely striate-punctate at base, very feebly punctate a little behind the constriction, with the exception of the sutural and second striae, which are distinctly, finely, and rather closely punctate, third to fifth striae with much finer and remotely placed punctules. Pygidium feebly and sparsely punctate, punctures bearing short erect gray pile. Ventral segments feebly and sparsely punctate, punctures forming one or two rows. Anterior femora long, moderately clavate, mutic; anterior tibiae about as long as the femora, very slender, moderately arcuate, inner surface finely serrate, villous, bimucronate at apex.

♂.—Anterior femora about three-fifths as long as the body; tibiae about four-fifths as long as the femora, very slender and very strongly arcuate, unimucronate at apex.

Length 3.5 to 4.5 mm.; width 2.2 to 3.5 mm.

Type locality.—Sierra Ancha Mts., Ariz., October 1, 1925 (D. K. Duncan).

Type ♀.—Cat. No. 28830, United States National Museum.

This species belongs in Sharp's group I, C: "Anterior femora without teeth or spines; eyes but little separated, the space between them sulcate or carinate; surface without pubescence" (*Xestolabus* Jekel), and appears to be nearly related to *callosus* Sharp,¹ as described and figured, agreeing in the prominent elytral humeri. The latter species, however, evidently lacks the conspicuous constriction behind them. In one specimen examined the depression on the right side of the thoracic disc is

¹Biol. Centr.-Amer., vol. IV, pt. 3, 1889, p. 7, Tab. I, fig. 6.

rather deeply concave but is lacking on the left side. Compared with *corvinus* Gyll., specimens of which are in the U. S. National collection, the present form is smaller and more distinctly black. The eyes are more prominent, as are also the elytral humeri, and the pronotum is much smaller, and both narrower and shorter.

Of this species Mr. Duncan writes that it occurred in abundance in September, 1924, on Workman Creek in the Sierra Ancha Mountains, Gila County, Ariz., at an elevation of between 4,000 and 5,000 feet in a somewhat inaccessible box canyon. The beetles were not found in any other locality either in that region or elsewhere in Arizona visited that season, and they were apparently feeding on wild grapevine and a low-growing bushy vine resembling, Mr. Duncan says, poison ivy, presumably a plant related to Virginia creeper.

***Attelabus (Himatolabus) disparipes*, new species.**

Of similar form to *rhois*, robust, opaque, rufous, clothed with fine golden pubescence. Head fully one-third longer than wide. Rostrum as wide as long, strongly dilated at apex, coarsely, rather deeply and irregularly punctate, punctures of irregular size. Antennal joint 1 not greatly longer than 2; 3 long and narrow; 4 and 5 subequal, nearly as long as wide; 6, 7, and 8 subequal in width; 8 short, nearly twice as wide as long. Prothorax slightly wider than long, narrowed at apex, sides subparallel in basal half; punctuation of surface much obscured by pubescence, punctures irregular in size, rather deep, and closely set, no median smooth line or other bare areas; base with a wide transverse sulcus. Elytra nearly as wide as long, subquadrate, humeri moderately prominent, abruptly rounded; surface coarsely, irregularly punctate, striae feebly defined. Pygidium feebly and sparsely punctate. Ventral segments more finely punctate than on pygidium.

♂.—Anterior femora long, strongly dilated, fully one-half as wide as long, much more strongly dilated and arcuate on posterior surface. Anterior tibiae fully as long as femora, very slender, strongly arcuate, moderately and acutely serrate on inner surface, bearing a single acute mucro.

♀.—Anterior femora much shorter, strongly clavate. Anterior tibiae as long as femora, very stout, outer edge nearly straight, apex strongly bimucronate.

Length 3.8 to 5.2 mm.; width 2.2 to 3.0 mm.

Type locality.—Arizona.

Type ♂.—Cat. No. 28824, U. S. National Museum.

This species may be separated from *rhois* by its brighter red color, finer and sparser golden pubescence, the absence of a smooth median thoracic line, much deeper transverse antebasal sulcus of the thorax, and feebly defined elytral striae. In the male the anterior tibiae are somewhat more strongly arcuate and in the female they are distinctly shorter and thicker than in *rhois*. The species is also a little larger and more robust.

In studying the above mentioned two species in comparison with other species of *Attelabus*, some observations were made which may be of interest as bearing on the secondary sexual characters. Neither Leconte nor Sharp treated of these characters as of generic or subgeneric value.

Of the sexual structure of *analís*, Leconte wrote (Rhynch. Am. No. Mex., 1876, p. 10) "♂. Ventral segments with two rows of acute tubercles," "♀. under surface of mouth with two small acute teeth projecting downwards." Primarily, the sexes may be identified by the larger size of the body, especially of the abdomen, in the female; second, by the shorter head and less prominent eyes than in the male; and third, by the straight tibiae armed at the apex with two strong hooks. In the male of *analís*, as also of *rhois*, the tibiae are longer, slenderer, and distinctly arcuate and bear at the apex a single hook, on the inner side. Such being the case, Leconte's definition of the sexes should be reversed. In the female of *analís* there are six abdominal tubercles proceeding in pairs from the first three segments and the teeth projecting backward from the mouth-parts of the male are smaller, but otherwise similar to these tubercles.

In the male of *nigripes* the tibiae are similar to those of *analís* but in the female they are moderately arcuate. In that of *bipustulatus* the tibiae are comparatively stout and much less distinctly curved, being less strongly differentiated from the female. In both of these species the femur is armed with an acute tooth, in the latter situated a little nearer the apex.

To summarize, in the case of our species of *Attelabus*: The tibiae ♂ are armed with only one hook at the apex and they are slenderer and more or less strongly arcuate, except in *nigripes* and *bipustulatus*, in which the males are distinguished by acutely toothed femora. In the females the tibiae bear two teeth at the apex, and they are usually stouter and shorter, and straight or feebly arcuate.

Since the above observations were written, the writer's attention has been called to the work of E. Voss (Stett. Ent. Zeitg., 1925) who has monographed this genus and made use of the characters which have just been mentioned. Voss adds two new species to our fauna, *Attelabus* (*Pilolabus*) *californicus* and *A.* (*Homoelolabus*) *coloradensis*.

THE GENUS *Dixa* IN COLORADO (DIPTERA: DIXIDAE).

BY T. D. A. COCKERELL.

On September 27, 1926, the Entomology class of the University of Colorado went out on the campus to secure material on which to begin the year's work. Sweeping just below the lake, Mr. Scott Gale was so fortunate as to find a female *Dixa*, the genus being new to this part of the country. Apparently the species is undescribed, and it may be made known as follows:

Dixa universitatis, new species.

Length about 4 mm.; head black, shining; palpi black; proboscis yellow; antennae dark; thorax pale straw yellow, dorsally with a very broad median black band on anterior two-thirds or rather less, abruptly truncate posteriorly; lateral bands broad and black on posterior half of thorax, but on anterior half reduced to a cloud, evanescent anteriorly; wings clear; halteres yellow; abdomen dusky yellow; legs dark greyish, pallid at base; femora black at extreme tip; hind tibiae enlarged and black at end. End of Sc a little before fork of R; fork of R_2-R_3 about one-fourth longer than the strongly arched stem; R-M cross-vein just before stem of R_2-R_3 and just beyond M-Cu cross-vein; fork of M about as long as its stem; anal arched at end.

A species of *Dixa* s. str. of Dyar and Shannon, and in Johannsen's (1923) key runs to *D. clavata* Lw., differing by the unclouded wing-veins, light proboscis and scutellum. Overlooking the tibial character, it might run to "*D. calbula* Williston," from St. Vincent, but the R-M cross-vein is so slightly before the stem of R_{4+5} that it partly intersects it. On looking up Williston's account we find that the species is really *Dixa clavulus* (clavulus, a little nail, not an adjective), and has the cross-vein much more basad, and the stem of R_{4+5} much shorter and less arched. Run on in the key, the species goes to *D. venosa* Lw., but differs at once in color of scutellum and halteres. It is quite different from the various Dyar and Shannon species. In Johannsen's earlier (1903) table it runs to *D. terna* Lw., but the venation is quite different.

Type.—Cat. No. 29540, U. S. N. M.

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NOTES ON SERPHOIDEA WITH DESCRIPTIONS OF NEW
SPECIES (HYMENOPTERA).

By ROBERT M. FOUTS, *Washington, D. C.*

This paper contains descriptions of fourteen new species belonging to the families Bethylidae, Calliceratidae, Diapriidae, and Scelionidae. All the species except one are from North America.

Family BETHYLIDAE.

Goniozus euliae, new species.

Female.—Length, 2.00 mm. Head a little longer than wide, slightly wider than the thorax; frons finely reticulate with small scattered punctures; carina on clypeus extending to lower third of eye; head above eye about two-thirds as long as eye; scape shorter than the three following joints united, less than three times as long as wide; third joint shorter and narrower than the second, one and one-half times as long as wide, as long as four; all flagellar joints somewhat longer than wide; thorax twice as long as wide; notauli absent; propodeum margined only laterally, without a median longitudinal carina, more or less elevated and polished down the median line; pronotum and mesonotum finely reticulate with scattered punctures; pronotum longer than the mesonotum, rounded anteriorly; wings hyaline, with short marginal cilia; branch of basal nervure nearly straight, about as long as the prostigma; abdomen somewhat less than one and one-third times as long as wide. Black; scape yellow, darker above; antennal joints two to seven yellow; terminal joints brown; legs black to very dark brown; anterior tibiae yellowish-brown; middle and posterior tibiae yellowish at extreme apices; tarsi yellow.

Male.—Length, 1.80 mm. Scape shorter than the two following joints united, about twice as long as wide; second and third joints subequal, about one and one-half times as long as wide; following five joints a little wider, nearly as wide as long; terminal joints somewhat narrower, longer than wide; abdomen a little more than twice as long as wide; pedicel yellow, darker above; antennal joints two to seven yellow; following joints light brown.

Type locality.—Winchester, Virginia.

Type.—Cat. No. 28770, U. S. Nat. Mus.

Host.—Larvae of *Eulia velutinana*, Walker.

Description based on three females and one male reared by Mr. W. S. Hough. Two specimens were reared on August 1, 1925. The other two are labelled "August, 1925."

Family CALLICERATIDAE.

Conostigmus ater, new species.

Female.—Length, 2.30 mm. Head one and three-fourths times as wide as long, one and one-eighth times as wide as the thorax; frons very finely and delicately reticulate, sparsely covered with small punctures; cheeks and vertex sculptured like the frons but without punctures; vertex bordered behind by a high and sharp carina; from this carina to the anterior ocellus extends a moderately deep crenulate furrow; head arcuately excavated posteriorly; scape about as long as the following four joints united; joint two twice as long as wide, as long as four, two-thirds as long as three; joint three a little wider at apex than two, somewhat narrower than four; joints four to eleven about seven-tenths as wide as long, cylindrical; joint eleven obconical, acute at apex, as long as three, about twice as long as wide; thorax one and one-third times as long as wide, about five-sixths as wide as the abdomen; upper surface of the thorax finely scaly reticulate, sparsely covered with small punctures; propleura wrinkled anteriorly, reticulate above and behind; abdomen one and two-thirds times as long as wide; second tergite as wide as long, strongly longitudinally striate on anterior one-third; wings whitish, pubescent, shortly ciliate on distal margin. Black; antennae piceous; legs pale brown, the coxae, all femora outwardly, and the posterior tibiae outwardly, darker; venation dark brown.

Type locality.—Milpitas, California.

Type.—Cat. No. 28771, U. S. Nat. Mus.; Paratype in Coll. Fouts.

Host.—Syrphid puparium.

Three females reared May 13, 1925, by Mr. R. F. Campbell.

This species differs from *nevadensis* in having the third antennal joint longer than the second.

Family DIAPRIIDAE.

Spilomicrus virginicus, new species.

(Fig. 1).

Female.—Length, 3.02 mm. Closely related to *keifferi* Fouts but differs as follows: Head seen from the side distinctly higher than long, the angle formed at the antennal prominence obtuse; third antennal joint nearly three times as long as wide; fourth joint twice as long as wide, a little longer than the fifth, two-thirds the length of the third; second tergite one and one-third times as long as wide; pubescence on first abdominal segment long and dense; color as in *keifferi*.

Type locality.—Falls Church, Virginia.

Type and paratype.—Cat. No. 28772, U. S. Nat. Mus. Paratype in Collection of Fouts.

Host.—Puparium of *Xylota bicolor* Loew on *Liriodendron tulipifera* Linn.

Aparamesius nigriclavus, new species.

Female.—Length, 2.10 mm. Head as wide as long, a little narrower than the thorax; antennal prominence forming the apex of an angle of about 90 degrees; scape six times as long as wide; pedicel twice as long as wide, as long as joint three, as wide as six; joint three two and one-half times as long as wide, as wide as four or five; joints four to thirteen subequal in length, becoming gradually wider toward apex; terminal six joints forming a club which is not sharply differentiated, joint eight being but very little wider than seven; club joints, except the last, about as wide as long; joint thirteen twice as long as wide, as long as

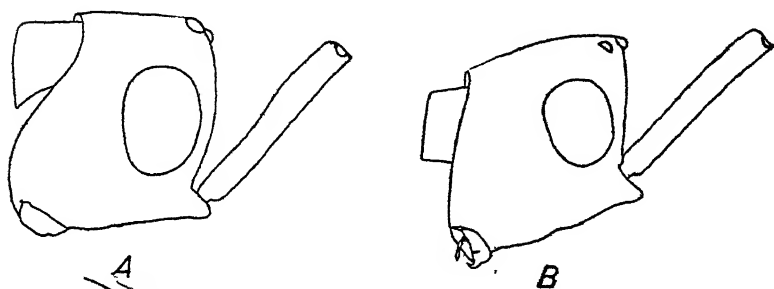


Fig. 1. A. Head of *Spilomicrus kiefferi* Fouts (Lateral view).
B. Head of *Spilomicrus virginicus* Fouts (Lateral view).

eleven and twelve united, as wide as twelve, acute at apex; thorax approximately one and three-fifths times as long as wide, narrower than the abdomen; mesopleuron separated from the mesosternum by two parallel carinae; basal prominence on propodeum short, subacute; basal vein absent; first tergite one and three-fifths times as long as wide, smooth, with several longitudinal ridges; second tergite one and one-half times as long as wide, with a very small median indentation at base; segments three to six united one-fourth as long as the second; fifth tergite a little longer than the sixth, longer than the third and fourth united. Black; scape rufous; antennal joints two to nine rufous, fuscous at their extreme apices; legs rufous, the femora darker above; wings with a brownish tinge.

Type locality.—McLean Bogs, New York.

Paratype locality.—Toronto, Canada.

Paratype in Coll. U. S. Nat. Mus., Cat. No. 28773.

The type was collected by Mr. M. D. Leonard at McLean Bogs on May 16, 1925. Mr. Herbert S. Parish collected the paratype on May 10, 1921.

Doliopria americana, new species.

Female.—Length, 1.02 mm. Head as wide as long, as wide as the thorax; scape as long as the following six antennal joints united; joint two as wide as seven, less than twice as long as wide; joint three shorter and narrower than two, a little longer than wide, as long as eight; joint four as wide as long, as wide as

three; joints five, six, and seven somewhat wider than long, widening slightly in the order named; eight transverse, button-shaped, wider than seven, narrower than nine; nine as wide as the scape, transverse, narrower than ten; ten about as wide as long, twice as long as nine; eleven as long as nine and ten united, indistinctly wider than ten, conical, blunt at apex; all antennal joints covered with short white hairs; thorax one and one-half times as long as wide, slightly narrower than the abdomen; thorax truncate anteriorly, the angles of the pronotum more or less prominent; notauli absent; mesonotum and scutellum flattened, the latter with a broad, shallow, immargined fovea at base; propodeum with a rounded polished elevation medially; first segment of the abdomen cylindrical, about as wide as long, covered with long white hair; second tergite a little more than one and three-eighths times as long as wide, pubescent at extreme base on the sides, with a very short median carina basally, and with a shallow immargined fovea on either side partially covered with short white hairs; abdomen truncate at apex, the terminal segments very short, together about as long as the first tergite. Black; scape rufous; pedicel brown; antennal joints three to eight reddish-brown; metapleurum and propodeum laterally rufous; legs yellow, wings hyaline.

Type locality.—Mount Holly Springs, Pennsylvania.

Paratype locality.—Carlisle, Pennsylvania.

Paratype.—Cat. No. 28774, U. S. Nat. Mus.

Type.—In Coll. Fouts.

Described from two specimens collected by the author. The type was swept from wheat on July 16, 1920. The paratype was swept from lawn grass on July 15, 1918.

***Galesus punctiger*, new species.**

Female.—Length, 2.60 mm. Head distinctly longer than wide; body entirely polished and shining; frons just above the base of the eye with a fairly large triangular projection; upper part of head behind eyes nearly as long as eyes; dorsal surface of head behind the ocelli with four moderately large pits arranged in a quadrangle, the area thus enclosed wider than long; on each side of this quadrangle is another large puncture; vertex along the posterior carina with several punctures; cheeks with a few smaller punctures; second antennal joint about as long as three, a little wider; three slightly longer and wider than four, a little less than twice as long as wide; joints four to twelve subequal in length; joints four to seven increasing gradually in width, the seventh as wide as the eighth; following joints to the twelfth transverse; twelve obconical, a little longer than two, rather blunt at apex; thorax one and one-half times as long as wide, one and one-ninth times as wide as the head; pronotum with a row of punctures across its posterior margin; pronotum pubescent, the hairs long, white; notauli complete, converging but not meeting posteriorly; median lobe of mesonotum near apex with two adjacent setigerous punctures; scutellum sub-convex, with two large, more or less circular, foveae at base and with a broad groove on each side; at the apex of the scutellum are two small pits; first abdominal segment 1.35 times as long as wide, cylindrical, with three longitudi-

nal ridges above; second tergite 1.72 times as long as wide, wider than the thorax, with a median sulcus extending nearly to its middle and with an inconspicuous basal impression on either side at base; segments following the second extremely short, not visible from above; anterior wing veinless, pubescent, ciliate, with a more or less distinct fold, with its distal margin cleft, the incision long; body black; flagellum piceous, the short white hairs causing it to appear grayish; legs reddish-brown, the tarsi yellow, coxae black.

Male.—Length, 2.80 mm. Head distinctly wider than long, sculptured as in the female but the pits on its upper surface larger and deeper; second antennal joint shorter and narrower than the third, scarcely longer than wide; joints three to fourteen subequal in width; three a trifle longer than four, a little less than twice as long as wide, widest in the middle; joints four to fourteen subequal in length, very little longer than wide; fourteen obconical, as long as three, acute at apex; flagellar joints pubescent, the length of the hairs on any segment about one-third its width; thorax a little less than one and one-half times as long as wide, one and one-seventh times as wide as the head, four-fifths as long as the second tergite; first tergite one and one-half times as long as wide, one-fifth as long as the second; second tergite about three-fifths as wide as long, one and one-fourth times as wide as the head; wings as in the female but the distal margin not cleft. The parts not described above are as in the female.

Type locality.—Uvalde, Texas.

Type.—Cat. No. 28775, U. S. Nat. Mus.

Host.—? *Drosophila* sp.

One female and four males reared, August, 1925, by Mr. Alan P. Dodd.

This is the first indication known to me that the emargination of the wings may be a secondary sexual character. Kieffer in his monograph of the Diapriidae (*Das Tierreich*, Lief. 44, 1916, pp. 200–235) cites no instance in which the sexes differ in wing structure.

The female of *punctiger* runs to *politus* in Kieffer's key (*ibid.*, p. 204) and differs in the shape of the head and in the structure of the antennae. The male runs in the same key to *clarimontis* Kieffer and differs in the structure of the antennae.

***Trichopria (Planopria) cubensis*, new species.**

Male.—Length, 1.26 mm. Runs to *melanopleura* Ashmead in Kieffer's key (*das Tierreich*, Lief. 44, 1916, p. 108). The first segment of the abdomen in *cubensis* is about one and one-half times as long as wide. Head as long as wide, narrower than the thorax; antennae a little longer than the entire body; scape cylindrical, five times as long as wide, as long as joints three and four united; pedicel oval, a little longer than wide, three-fourths the length of the third joint; third joint two and one-half times as long as wide, a little shorter and narrower than the fourth; fourth joint as wide as the scape, somewhat over twice as long as wide, shallowly emarginate on basal two-thirds; joints five to fourteen subequal,

narrowed proximally, about twice as long as wide; last joint as long as the fourth, about three times as long as wide, acute apically; flagellar joints with whorls of long hairs, the hairs about as long as the joints; thorax about one and four-fifths times as long as wide, narrower than the abdomen; mesonotum subconvex, without a trace of notauli; scutellum with a shallow circular fovea at base, the depression more than half as wide as the scutellum; scutellum subconvex, about as wide as long, truncate posteriorly, without a trace of a ridge or carina posteriorly; propodeum with three longitudinal carinae, the middle one not elevated at base, larger than the others; propodeum thickly covered with rather short white hairs laterally; medially, between the smaller carinae, it is bare and shining; abdomen one and two-fifths times as long as the thorax; petiole dorsally densely covered with moderately long white hairs; second tergite one and one-fourth times as long as wide; wings hyaline, long, extending two-thirds the length of the abdomen past the latter's apex; scape and pedicel yellow; flagellum brown; head black; thorax and petiole yellow, tinged with reddish; abdomen black, yellowish basally on the sides; legs bright straw-colored.

Female.—Length, 1.49 mm. Runs to *mellea* Ashm. in Kieffer's key (ibid. p. 82) and differs in having the antennal club black. Head a little longer than wide, indistinctly narrower than the thorax; scape four times as long as wide, as long as the following four joints united; pedicel a little narrower than the scape, not much longer than wide, as long as the third joint; third joint twice as long as wide, narrower than the second, a little narrower but distinctly longer than the fourth; joints four to eight subequal, about three-fourths as wide as long; joint eight as wide as long, as wide as seven, considerably narrower than nine; joint nine as long as ten, a little longer than wide; joints ten and eleven equal, as wide as long, twice as wide as eight, as wide as twelve at base; last joint about three-fifths as wide as long, blunt at apex; pubescence on joints three to nine longer than the joints are wide; thorax about one and four-fifths times as long as wide, five sevenths as wide as the abdomen; abdomen one and two-thirds times as long as the thorax, about twice as long as wide; petiole about as wide as long; second tergite one and three-sevenths times as long as wide; wings hyaline, extending one-third the length of the abdomen past the latter's apex; scape and funicular joints light brown; club joints black; head reddish brown, rufous behind the ocelli; thorax brownish yellow; mesonotum and scutellum bright yellow; abdomen dark brown; second tergite basally on the sides and tergites five and six entirely brownish-yellow.

Type locality.—Colon, Cuba.

Type, allotype and three paratypes in Coll. U. S. N. M., Cat. No. 28776.

Host.—*Lixophaga diatreae* Towns. (puparia).

Described from four males and three females collected in 1920 by Mr. T. E. Holloway.

***Trichopria (Trichopria) popenoei* Ashmead.**

Trichopria popenoei Ashmead, Bull. 45, U. S. Nat. Mus., 1893, p. 435.

Trichopria (Trichopria) popenoei Ashmead, Kieffer, Das Tierreich, Lief. 44, 1916, p. 95.

Female.—Length, 1.50 mm. Head a little wider than long, narrower than the thorax; antennae distinctly longer than the head and thorax united, gradually thickened toward tip, without a distinct club; pedicel about as long as the third joint, a little wider than the third; following five joints subequal in length, becoming gradually thicker distally; ninth joint spherical; joints ten and eleven slightly wider than long, the latter a trifle wider and longer than the former; twelfth joint nearly as long as the two preceding united, not quite twice as long as wide, not very sharp at apex; thorax one and one-half times as long as wide, narrower than the abdomen; scutellum quadrate, with a short indistinct median ridge posteriorly; propodeum with a high median longitudinal ridge; this ridge curving abruptly downward at the middle of the propodeum; second tergite one and three-eighths times as long as wide; sides of abdomen slightly curved, more strongly so anteriorly.

Type locality.—Riley County, Kansas.

Type.—Cat. No. 24478, U. S. Nat. Mus.

Description based on the type. The male described by Ashmead is a different species.

Trichopria (Trichopria) illinoiensis Girault.

Trichopria popenoei illinoiensis Girault, Proc. U. S. Nat. Mus., Vol. 58, 1920, p. 178.

Female.—Length, 1.77 mm. Head a little wider than long, slightly wider than the thorax; antennae with a distinct four-jointed club, joint eight being much narrower than nine; pedicel a little longer and thicker than the third joints; joints four to eight subequal in length, the eighth a little thicker; joints nine to twelve equally wide, twice as wide as eight; joints nine and ten subequal, slightly wider than long; eleven quadrate; joint twelve longer than eleven but *distinctly* shorter than ten and eleven united, conical, sharply pointed apically, a little less than twice as long as wide; antennae somewhat longer than the head and thorax united; thorax one and six-sevenths times as long as wide, three-fourths as wide as the abdomen; fovea of scutellum as in *popenoei*; scutellum quadrate as in *popenoei* but with posterior elevation scarcely noticeable; propodeum not so elevated as in *popenoei*, the median ridge seen laterally not much curved; abdomen about one and one-sixth times as long as the thorax; sides of abdomen more curved than in *popenoei*; anteriorly the abdomen is strongly narrowed; second tergite one and one-fourth times as long as wide.

The paratype seems to belong to a different species. The abdomen is one and one-sixth times as long as the thorax, and the second tergite is nearly one and one-half times as long as wide. The paratype is, moreover, somewhat larger, being 2.02 mm. long.

Type locality.—Urbana, Illinois.

Type.—Cat. No. 20842, U. S. Nat. Mus.
Description based on the type and paratype.

Trichopria (*Trichopria*) *abdominalis*, new species.

Female.—Length, 1.48 mm. Differs from the type of *illinoensis* in having the second tergite one and two-thirds times as long as wide. Head very little wider than long, a trifle narrower than the thorax; antennae essentially as in *illinoensis*, with a four-jointed club; eighth joint spherical, distinctly more than half as wide and very little shorter than the ninth; last four joints as in *illinoensis*; thorax one and two-thirds times as long as wide, wider than high; fovea at base of scutellum as in *popenoei*; scutellum as in *illinoensis*, without a median posterior elevation; the propodeum is different from that found in either of the two species just mentioned; the median ridge is not present behind the anterior one-fourth, this latter part forming a square plateau as high as the posterior edge of the scutellum; abdomen one and three-tenths times as long as the thorax, one and one-sixth times as wide as the thorax; sides of the second tergite straight and nearly parallel, curving inwardly anteriorly. Body shining black; funicle reddish-brown; femora and tibiae brown; tarsi lighter.

One paratype has the head as long as wide.

Type locality.—Riverton, New Jersey.

Type.—Cat. No. 28777, U. S. Nat. Mus. Two paratypes in Coll. Fouts.

Host.—Dipterous puparium.

Description based on four females reared, August 1, 1922, by Mr. T. H. Frison.

***Belyta longicollis*, new species.**

Female.—Length, 4.00 mm. Body elongate; head seen from above two-thirds as wide as long, seen from the side five-sixths as high as long; pedicel as long as the third joint, as wide as the latter at apex; following joints moniliform; last joint conical, as long as the pedicel; thorax about twice as long as wide, one and two-fifths times as wide as the head, slightly wider than the second tergite; pronotum narrowed necklike anteriorly, bulging out in front of the tegulae; median carina on propodeum diverging at apical one-third; apical angles of propodeum distinctly projecting but not prominently so; first abdominal segment a little over twice as long as wide, more or less rugose, with two slightly diverging carinae down the middle, the area between these carinae smooth, with a few transverse wrinkles; second tergite a little over twice as long as wide; median sulcus on second tergite extending distally one-third the length of the segment; second tergite basally with two short depressions on either side of the larger one; legs and antennae rufous, the antennae darker distally; wings brown; radial cell closed, about six times as long as the punctiform marginal vein.

Type locality.—Mount Holly Springs, Pennsylvania.

One specimen collected by the author on July 7, 1918.

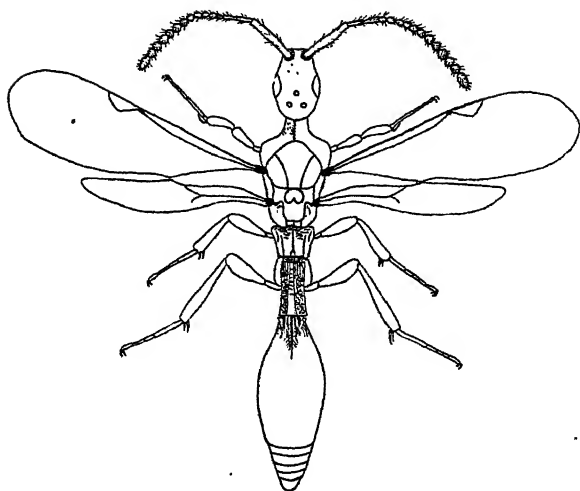


Fig. 2. *Belyta longicollis* Fouts. Female

Family SCELIONIDAE.

Platygaster exiguae, new species.

Female.—Length, 1.30 mm. Runs to *marylandica* Fouts in the author's key (Proc. U. S. Nat. Mus., vol. 63, 1924, p. 28) and differs in the structure of the scutellum. In *marylandica* the scutellum is polished and evenly convex above.

In *exiguae*, on the contrary, its dorsal surface is roughened and covered closely with short white hairs. These hairs are so fine and small as to be scarcely visible. In this species, moreover, the superior face of the scutellum encroaches upon the posterior face producing a sort of low crest or ridge. Head twice as wide as long, a little wider than the thorax; all antennal joints, except the third, longer than wide; pedicel as long as the ninth joint, twice as long as wide; joint ten twice as long as wide, longer than nine, blunt at apex; thorax a little more than one and one-third times as long as wide, higher than wide, slightly narrower than the abdomen; second tergite indistinctly longer than wide; striae on second tergite numerous, extending a little past the middle of the segment; body and appendages entirely black.

Type locality.—Oxford, Colorado.

Paratype.—Cat. No. 28778, U. S. N. M.

Type.—In Coll. Fouts.

Described from two specimens reared, June 13, 1921, from a gall of *Rhabdophaga coloradensis* Felt on *Salix exigua*. These specimens were sent to me for identification by Dr. E. P. Felt and are recorded under his number A-3198.

Platygaster distincta, new species.

♂ *Male*.—Length, 1.62 mm. Runs direct to *lupinicola* in the author's key (Proc. U. S. Nat. Mus., vol. 63, 1924, p. 29) and differs principally in having the flagellar joints more elongate. Head twice as wide as long, a little wider than the thorax, slightly excavated behind; pedicel twice as long as wide, one and one-third times as long as the third joint and distinctly wider than the third; joint three one and one-half times as long as wide, half as long as four; joint four slightly longer than two, as long as five, narrowed at both ends, angulate just before the middle where it is widest, half as wide as long; joint four not emarginate proximally, joints five–ten subequal, cylindrical, nearly three times as long as wide; ten about as long as three and four united, three times as long as wide, acute at apex; flagellum densely covered with erect white hairs, these hairs longer than the joints are wide; thorax two-thirds as wide as long, eight-ninths as wide as high, six-sevenths as long as the abdomen, strongly convex dorsally; notauli indicated posteriorly, the median lobe of the mesonotum touching the scutellum, narrowly truncate at apex; scutellum highly convex, polished, sparsely pubescent; wings hyaline, pubescent, extending half the length of the abdomen past the latter's apex; abdomen about as wide as the thorax, a little less than twice as long as wide; second tergite a trifle longer than wide; basal foveae on second tergite striate, the striae not quite attaining the middle of the segment; each of the tergites following the second with a transverse row of setigerous punctures; tergites three to seven together more than half as long as the second; black; anterior tibiae at base and apex yellowish-brown; tarsi dark brown.

Type locality.—San Francisco, Calif.

Type.—Cat. No. 28872, U. S. Nat. Mus.

Three paratypes in Collection Fouts.

Description based on six specimens collected by Mr. E. Walther and recorded as being probably parasitic on *Thecodiplosis*.

Platygaster flavitarsis, new species.

Female.—Length, 1.19 mm. Runs direct to *marylandica* Fouts in the author's key (Proc. U. S. Nat. Mus., Vol. 63, 1924, p. 28). It differs in having the median lobe of the mesonotum truncate and half as wide at the apex as the scutellum. Head twice as wide as long, wider than the thorax, not emarginate posteriorly; frons finely diagonally aciculate; pedicel twice as long as wide, nearly as long as the following two joints united; third joint half as long as the pedicel, longer than wide, a little narrower than four; joint four as long as six, as wide as five, slightly less than twice as long as wide; joint six as long as seven, as wide at apex as seven, narrowed proximally; joints seven, eight, and nine subequal, distinctly, but only slightly, longer than wide; joint ten as long as two, a little longer than nine, one and one-half times as long as wide, subacute at apex; pubescence on antennal joints very short; thorax one and one-third times as long as wide; notauli distinct on posterior half of mesonotum, nearly parallel;

median lobe of mesonotum truncate posteriorly, touching the scutellum; scutellum transverse, highly convex, polished, higher than the mesonotum at base, with numerous long white hairs laterally; first tergite evenly rounded above, the median area not defined; striae on second tergite extending to the middle of the segment; second tergite one and one-ninth times as long as wide, narrower than the thorax; tergites three, four and five equally long, a little shorter than the sixth, without distinct sculpture; last four tergites together two-thirds the length of the second; first joint of middle tarsi about seven times as long as wide; wings extending the length of the last three segments past the apex of the abdomen; black; legs dark brown; anterior femora at extreme apex, anterior tibiae on apical half, and anterior tarsi, yellowish; middle and posterior tarsi light brown; wings hyaline.

Type locality.—Glen Echo, Maryland.

Two paratypes in Coll. U. S. Nat. Mus., Cat. No. 28779.

Described from six specimens* collected by the author, May, 1925, on the leaves of Elder.

Leptacis polita, new species.

Female.—Length, 1.19 mm. Head one and one-half times as wide as long, one and one-sixth times as wide as the thorax; frons shining, faintly shagreened; lateral ocelli less than their diameter from the eye margin, a little more than their diameter from the anterior ocellus; cheeks subconvex; occiput flattened, separated from the vertex by a low but sharp carina; seen from above the head is as long behind this carina as the distance from the carina anteriorly to the lateral ocelli; scape about as long as the last four antennal joints, rather slender, a little over five times as long as wide, widest in the middle; pedicel about twice as long as wide, three times as wide as the third joint, one and two-fifths times as long as the third joint; fourth joint twice as long as the third, about five times as long as wide, as wide at base as the third, slightly thickened toward apex; fifth and sixth joints subequal, a little longer than wide, distinctly wider than the fourth; seventh joint as long as the fourth, slightly wider than the pedicel, two and one-third times as long as wide, one and two-fifths times as long as the eighth; eighth and ninth joints subequal, distinctly wider than the seventh, a little longer than wide; last joint as long and as wide as the seventh, conical, acute at apex; pubescence on flagellar joints short and inconspicuous; thorax twice as long as wide, as wide as the abdomen, one and one-fourth times as high as wide; pronotum with two sharp vertical carinae enclosing an anterior triangular space, this area delicately shagreened; mesonotum shagreened, convex, without a trace of notauli; apical margin of mesonotum entire, the median lobe not distinguishable; scutellum highly elevated, hump-like anteriorly, compressed, shagreened, prolonged into a long sharp spine posteriorly, the spine extending as far backward as the apex of the first abdominal segment; abdomen scarcely longer than the thorax; first tergite two-thirds the length of the second, with the pubescence very sparse and short; second tergite one and one-fourth times as long as wide, strongly convex, without pubescence basally; at the base of the second tergite are two small indentations homologous to the

foveae in *Platyaster* and allied genera; wings subhyaline, rather narrow, the anterior pair without marginal cilia, extending half the length of the abdomen past the latter's apex; pubescence on front wings sparse, arranged in rows; tibiae strongly clavate; upper half of head dark brown, lower half yellowish-brown; scape and legs, except the swollen parts of the femora and tibiae which are darker, yellowish-brown; flagellum and club black; pronotum, pleurae, propodeum, and first abdominal segment rufous; thorax and abdomen, except as indicated, black.

Type locality.—Hamburg Farm in Santa Clara Province, Costa Rica.

Type.—Cat. No. 28780, U. S. Nat. Mus.

One specimen collected, May 28, 1925, by Mr. F. Nevermann.

Anteris reticulata, new species.

Female.—Length, 1.73 mm. Head, except as noted below, dorsal surface of thorax, and the last four abdominal tergites, finely shagreened; head as wide as the thorax, 1.69 times as wide as long, emarginate posteriorly; head below compound eyes strongly carinate, the carinae converging at the mandibles; lateral ocelli touching the eye margin; scape 2.38 times as long as the pedicel, a little wider than the pedicel; pedicel twice as long as wide, nearly as long as the three following joints together; third joint a little longer than wide, narrower than the pedicel; joints three to seven equally wide; joints four to seven equally long; last six joints forming a closely articulate club, all the joints except the last of which are transverse; joints 9–12 about twice as wide as long; twelfth joint conical, as long as wide, a little longer than the eighth; thorax 1.11 times as long as wide, indistinctly narrower than the abdomen, broadly rounded anteriorly, narrowed posteriorly, widest across the tegulae; notauli distinct on posterior two-thirds of the mesonotum; scutellum subconvex, unarmed, separated from the mesonotum by a row of deep punctures; scutellum traversed by a row of smaller punctures near the apex, the narrower band posterior to this row polished; metanotum armed with a short erect spine; propodeum unarmed; abdomen 1.80 times as long as wide, 1.65 times as long as the thorax, broadly elliptical, more or less pointed at apex; first tergite three times as wide (at apex) as long, traversed by about a dozen longitudinal carinae, second tergite twice as long as the first, 2.63 times as wide (at apex) as long, carinate like the first but the carinae not present on the posterior third of the segment; third tergite 1.95 times as long as the second, 1.69 times as wide as long, as wide at base as at apex, the sides nearly straight; fourth tergite one-fourth the length of the third, 1.57 times as long as the fifth, 1.83 times as long as the sixth; wings pubescent and ciliate; marginal vein short, thickened, not as long as the radius; radius straight, without a knob at tip; basal vein and metacarpa wanting; shining black; antennae dark brown, the scape at base yellowish; legs light brown; wings hyaline.

Male.—Length, 1.62 mm. Except in the following particulars this sex agrees with the description given above; scape about as long as the following 5 antennal

joints united, scarcely as wide as the eighth joint; pedicel very little longer than wide, as long as three but somewhat wider than third, as wide as five; four and five as long as wide, narrower than six; six to ten subequal in width, broadly transverse; ten indistinctly narrower than nine, wider than long, a trifle wider than eleven; eleventh a little wider than long, wider than twelve; twelve twice as long as wide, twice as long as eleven, conical, subacute at apex; second tergite 2.47 times as wide (at apex) as long; third tergite 1.86 times as long as the second, 1.54 times as wide as long; fourth tergite more than one-third the length of the third, twice as long as the fifth; fifth tergite as long as the sixth and seventh together; antennae and legs light brown.

Type locality.—Washington, D. C.

Two specimens collected in grass by the author on July 14, 1917. They were copulating when collected.

This is the only species of *Anteris* known to inhabit North America. It agrees with Kieffer's description of the genus. (Gen. Ins., Fasc. 80B, 1910, p. 80.)

A NEW OTIORHYNCHID WITH SINGLE TARSAL CLAWS (COLLEOPTERA.)

By L. L. BUCHANAN, *U. S. Biological Survey*.

Single tarsal claws are found among the Curculionidae of this region in the genera *Brachybamus*, *Barilepton*, *Eisonyx*, and *Mononychus*, but are not known to occur in any North American Otiorhynchid with the exception of the remarkable species described below. This unique weevil belongs to the Simoini of the Leng catalog (Periteli of Horn), and by Horn's classification (1876, p. 66), falls in the group having the articular surface of the hind tibiae scaly, along with *Eucyllus*, *Thinoxenus*, etc.

EUCILINUS, new genus.

Body small and stout; vestiture consisting of scales, setae, and hairs; prothorax very broad; articular surface of all the tibiae scaly; claws single; mentum small and deeply sunk in its cavity; mandibular scar on face of mandible itself; gular region with a pair of short, deep grooves convergent forward.

Sides of beak strongly convergent from eyes forward; alae not dilated. Scrobes in apical half somewhat more broadly visible from above than from the side, moderately arcuate and directed toward eyes. Scape biarcuate, reaching slightly past anterior margin of prothorax, the funicle a little shorter. Eyes rounded, partially grooved, and laterally placed though not at all concealed from above. Elytra broad, with rows of punctures, the 10th or outer row uniformly distinct to apex, sides deeply embracing abdomen. Scutellum minute. Mid-coxae narrowly separated, side pieces of mesosternum unequal, metepisternal suture not visible. Rear coxae separated by their own width, inter-

coxal process broad and subtruncate. Metasternum nearly as long as 2d ventral segment at middle. First abdominal suture arcuate at middle, 1st segment a little shorter than 2d + 3d, 2d at middle about as long as 3d + 4th, 5th slightly shorter than 2d. Legs moderately stout, the tibiae flattened, strongly dilated at outer apical angle, and with the apical spinules broad and blunt; anterior and middle tibiae mucronate; tarsi rather narrow, 3d segment bilobed.

Genotype.—*Eucilinus mononychus*, new species.

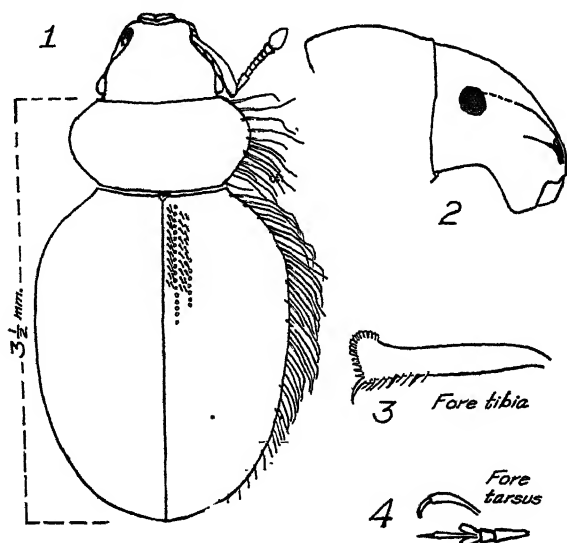


Fig. 1, *Eucilinus mononychus*, dorsal view; fig. 2, side view of head and prothorax; fig. 3, fore tibia; fig. 4, fore tarsus, and claw segment from side.

***Eucilinus mononychus*, new species.**

Length, 3.5–3.8 mm. (thorax and elytra). Uniform pale grey to white. Body and appendages setose and densely scaly. Chitin of an obscure reddish color. Beak feebly concave along middle, continuous with head in profile; setae closer laterally. Nasal plate with high rim, lunate, twice as broad as long. Eyes rather small, rounded, moderately convex. Prothorax transversely oval (60 to 31), its side margins with long, soft, laterally projecting hairs, some of which are at least $\frac{1}{2}$ length of scape. Elytra suboval (21 long to 17 broad), with rows of small punctures which are slightly larger on sides and on declivity, but in general separated by from once to twice their own diameter; intervals setose; lateral margins of elytra with long hair as on prothorax. The single tarsal claw moderately long and arcuate.

Head and beak much longer than prothorax (50 to 31). Width of head across eyes $\frac{1}{4}$ greater than length of prothorax (40 to 31). First funicular segment stouter and longer than 2d + 3d, 2d longer than 3d, 3d to 7th from moderately to strongly transverse. Diameter of eye nearly equal to that of pos-

terior portion of scrobe; margin of eye grooved except for posterior-ventral arc. Vertex convex, evenly, sparsely punctate and setose. Prothorax with setae and punctuation as on vertex, convex transversely and longitudinally, sides very strongly divergent, apex broadly emarginate, base truncate, scales dense and a little larger and more distinctly striate than on beak. Margin of sternum behind fore coxae with a dense fringe of matted down hair. Elytra with the intervals broad, flat and equal, each rather closely set with a confused double, or partly triple, row of fine erect setae which are short along suture but become progressively a little longer toward sides, those on 7th interval abruptly much longer and softer. Declivity about perpendicular. Legs scaly and setose and with long sparse hair. Fore tibia with its anterior face convex, the posterior flat, outer edge sharp, articular surface in same plane with posterior face and not set off from it by spinules; hind tibiae longest, fore tibiae next in length, middle pair shortest. Tarsi rather narrow, hind pair with 1st segment longer than $2d + 3d$, 4th as long as 1st; front tarsi shorter, claw segment longer than 1st.

Type locality.—Utah (Type and 3 paratypes).

Other locality.—Arizona (1 paratype).

Type.—Cat. No. 28911, U. S. N. M.

All 5 specimens seem to be ♀♀. The tibial structure in general indicates burrowing habits, though the long soft hair would not seem to support this idea.

NEW SPECIES OF BOLOSCHESIS (=CHLAMYS) WITH NOTES ON KNOWN SPECIES (COLEOPTERA; CHRYSO- MELIDAE; FULCIDACINAE).

BY CHAS. SCHAEFFER, *Brooklyn Museum, Brooklyn, N. Y.*

The change of familiar and time-honored names and their replacement with modern inventions is always unpleasant, but Jacobson, 1924 (Rev. Russe d'Ent., Vol. 18, p. 239) recognizing the prior use of *Chlamys* by Bolton for a genus of Mollusca, and of *Diaspis* by Brems for our familiar scale insects, has proposed the names *Boloschesis* and *Diplacaspis* to replace these homonyms. At present we have no recourse but to adopt them. The latter genus will probably be suppressed, however, under the former since the chief distinguishing character, the failure of the elytra to meet continuously behind the scutellum and the consequent development of the metanotum into a so-called second scutellum, is a variable character and the very small bifid instead of dentate claws are not likely to be satisfactory for generic definition. The new subfamily name is based upon the gigantic Brazilian forms to which the genonym *Fulcidax* was applied by Voet 1806.¹

¹Mr. H. S. Barber has called my attention to the change of names, which I had overlooked, and has kindly added this introductory paragraph.

Our indigenous species formerly known as *Chlamys* are rather difficult to identify from descriptions. *Memnonia* Lac. has hitherto been easily determined, but when two additional species were distinguished, these being similar to *memnonia* and *confusa* in the display of the "second scutellum" and, in some lights, of a darker colored discal velvety spot on each elytron, the identity of the true *memnonia* became very doubtful. Moreover California was mentioned in addition to the type locality, Mexico, in the original description of *moestifica* and the exact identity of the latter species which has never been included in our lists became of great interest, especially since the descriptions of both offer scarcely any satisfactory means of distinction because of the variability of the characters mentioned. The species identified at present as *memnonia* differs from the rest of the related species, with the exception of *prosternalis*, by the absence of a yellow spot within the emargination of each eye and rather larger, more prominent elytral tubercles, while the rest of the species have a distinct yellow eye spot and the elytral tubercles less prominent. Types or cotypes of *memnonia* and *moestifica* are in the British Museum as stated by Mr. Jacoby in the "Biologia" and at my request Mr. Arrow kindly sent me Mexican specimens of both species compared and labelled by Mr. Jacoby, also some unidentified Mexican and North American species. Unfortunately the specimens sent as *memnonia* and *moestifica* belonged to one species differing only in size, and were of no assistance. On further inquiry, also regarding the presence or absence of a yellow eye spot of both species, Mr. Bryant, to whom my questions were referred by Mr. Arrow, wrote me that *moestifica* has a yellow eye spot but *memnonia* has no spot; and he further writes that the specimens I returned and labelled *confusa* are apparently the same as *moestifica*. According to this information, *memnonia* was correctly identified and my *confusa* becomes a synonym of *moestifica*.

For the privilege of studying the material in the National Museum I am indebted to Messrs. Schwarz and Barber and to Dr. Henry Skinner for the loan of specimens from the collections of Dr. Horn.

The following key for the determination of the North American species of *Boloschesis* (= *Chlamys*) is a modification of the one published in 1907 with the new species added.

Key to the North American Species of Boloschesis.

- | | |
|--|-----|
| 1. Body beneath uniformly metallic or black..... | 2. |
| Body beneath pale or bicolored..... | 11. |
| 2. Legs entirely black or metallic..... | 3. |
| Legs more or less pale..... | 10. |

3. Metascutellum visible.....4.
Metascutellum covered.....8.
4. Prosterum between the coxae wide with sides broadly emarginate, widening behind the coxae and obliquely narrowing to apex at about apical fourth; color cupreous.....*prosternalis* Schffr.
- Prosterum narrow between and behind the coxae, gradually narrowing to apex.....5.
5. A yellow spot within the emargination of each eye.....6.
Emargination of eye without a yellow spot.....*memnonia* Lac.
6. Longitudinal median impressed line dividing the prothoracic tuberosity into two lobes very distant and deep7.
- Longitudinal median impressed line of prothorax indistinct and feeble; color cupreous, elytral sculpture coarsely punctate-rugose.....*subelata*, n. sp.
7. Elytral punctuation relatively fine or moderate, the punctures generally well separated; color usually dark cupreous.....*moestifica* Lac.
- Elytral punctuation relatively large and more or less confluent, producing a rather coarse, punctate-rugose sculpture; color bright cupreous.....
scabripennis, n. sp.
8. Small species, about 2.5 mm. long, reddish cupreous, sides of prothorax obsoletely strigate, elytra generally distinctly punctate.....
tuberculata Klug.
Larger species, about 3.4 mm. long, cupreous to almost black.....9.
9. Elytra generally finely and sparsely punctate, punctures occasionally very feeble or absent or quite distinct; prothorax rather finely strigate-rugose, tuberosity moderately deeply divided into two lobes.....*gibbosa* Fab.
- Elytra distinctly and rather coarsely punctate; prothorax more coarsely and more evenly strigate-rugose, tuberosity less deeply divided and surface generally more shining than in *gibbosa*.....*cribripennis* Lac.
10. Oblong, black, opaque, front of head, antennae and legs more or less reddish; prothorax coarsely strigate on disk of front, above at middle of tuberosity moderately broadly canaliculate*foveolata* Knoch.
- Short, rather robust, dark cupreous, antennae, labrum, tarsi and tibiae in about apical half reddish; prothorax uneven in front, sparsely but coarsely punctate, intervals between the punctures finely strigate, tuberosity broadly divided into two lobes, next to each lobe a moderate tubercle and near the base of the tuberosity at middle two rather prominent tubercles when viewed laterally or posteriorly.....*quadrilobata*, n. sp.
11. Body above obscure-metallic, finely pubescent; head, antennae, apical and side margins of prothorax, legs, underside of body and pygidium pale, coarsely and densely punctured and with two shining, black spots on the anterior face of the gibbosity; elytra with about nine black or aeneous tubercles, surface cribrately punctured.....*maculipes* Chev.
- Body above yellowish or ferrugineous, more or less varied with darker markings.....12.
12. Prothorax distinctly and rather coarsely punctate.....13.
- Prothorax not punctate, sculpture indistinctly reticulate, color yellowish green, with two darker spots on each side of basal lobe; elytra ferruginous with a darker postscutellar spot.....*texana* Schffr.

13. All the antennal joints pale, color ferruginous with darker markings on prothorax and elytra; punctuation of elytra confused and tubercles moderately distinct.....*huachucae* Schffr.
 — Last four or five joints of antennae black, color usually yellowish-testaceous with ferruginous or black markings; punctuation of elytra on the disk forming more or less regular rows, tubercles absent or feeble.....*arizonensis* Linell.

***Boloschesis subelata*, new species.**

Form of *gibbosa*, Fab. but elytra coarsely punctate-rugose and with a very distinct metascutellum. Cupreous more or less shining, antennae, labrum and a spot within the emargination of each eye, yellowish. Head very finely strigate-rugose with a few moderate punctures anteriorly; antennae pale, third joint a little longer than fourth, fifth triangular but narrower than the sixth joint. Prothorax with a rather feebly canaliculate tuberosity, surface finely strigate-rugose, sparsely punctate, punctures moderate, but a little larger at sides of apex of tuberosity where the surface is less even. Elytra with the usual tubercles, which are, however, rather feebly distinct and more or less confluent anteriorly from the humeral to the median tubercle near suture and then to the sub-median basal tubercle; near lateral margin an arcuate elevated line from about middle to not quite to apex; intervals, especially between the confluent tubercles, coarsely and densely punctate-rugose; metascutellum narrow, carina-like. Prosternum finely rugose and as usual narrow between the coxae. Pygidium finely strigate-rugose with the usual median carina and more or less distinct ocellate punctures. Body beneath with large punctures; claws broadly appendiculate. Length 3.75 mm.

Tucson, Arizona (Hubbard), Goffs, California (Rehn and Hebard).

Type and paratype (Tucson, Arizona).—Cat. No. 29463, U. S. National Museum; paratypes in collection, American Entomological Society, Philadelphia, and one paratype in collection, Brooklyn Museum.

This species, the type and paratype of which were reared from larval cases on *Larrea tridentata* (*Covillea glutinosa*) will be readily known from those having a visible metascutellum and a yellow eye spot by the very coarse punctate-rugose elytra and the form of prothorax, which is slightly lower and the summit of tuberosity is more regularly arcuate and at middle more feebly canaliculate than in the other species. The elevated sinuous ridges of the elytra, caused by the confluence of the tubercles, are less distinct.

***Boloschesis scabripennis*, new species.**

Form of the smaller specimens of *gibbosa* Fab. but elytra coarsely punctate-rugose and with distinct metascutellum. Color cupreous, antennae, labrum and

a small spot within the emargination of each eye reddish. Head very finely strigate-rugose with a few moderate punctures anteriorly and posteriorly. Prothorax with distinct and moderately deeply canaliculate tuberosity; surface finely strigate-rugose, scarcely punctate in front but more distinctly at sides and anteriorly near the summit of the tuberosity where the surface is rather subrugose and more uneven than below. Elytra with the usual tubercles, which are more or less confluent but not as clearly defined as mostly in *memnonia* and *moestifica*; near lateral margin an arcuate, elevated line running parallel with the margin from about middle to not quite to apex; surface, especially between the confluent tubercles, coarsely and densely punctate-rugose, between the punctures when visible moderately finely rugose; metascutellum distinct but narrow. Prosternum finely rugose, narrow between the anterior coxae. Pygidium finely rugose with the usual median carina and occasionally a few smooth spaces. Body beneath with large punctures; claws broadly appendiculate at base. Length 3.5 mm.

Texas, Marathon, June (Mitchell and Cushman), El Paso (ex+Love, Brooklyn Museum); New Mexico, close to N. M. Agr. College, May (Cockerell, U. S. Nat. Mus.); California, Riverside, April (coll. O. Dietz); Arizona (coll. Riley, U. S. Nat. Mus. and Brooklyn Mus.).

Type (Marathon, Texas).—Cat. No. 29464, U. S. National Museum; paratypes in Nat. Museum and Brooklyn Museum. The paratype from New Mexico is labelled "on *Larrea*."

This species differs from the above described *subelata* in having a more suddenly declivous and more deeply canaliculate prothoracic tuberosity. From *moestifica* it differs in having a much coarser elytral sculpture and the prothorax smoother anteriorly. It is more closely related to the latter than to the other species.

***Boloschesis moestifica* (Lac.)**

Chlamys moestifica Lacord. 1848.

Chlamys confusa Schaeffer 1920

This species was described from Mexico and California by Lacordaire but has never been recognized here in North America. Lacordaire's specimens came from Dupont and were, like other species from the same source, not collected in California but in Arizona.

Of the North American species displaying the metascutellum and a yellow spot within the emargination of each eye this species has a much less rugose elytral sculpture but a rather more coarse sculpture anteriorly of each lobe of the prothoracic tuberosity which Lacordaire describes as follows: "Chacun des lobes * * * est creusé en avant d'une assez grand fossette et le reste est convert de petites crêtes formant une sorte de

reseau irregulier a mailles incompletes." This is of course variable but of none of the species have I seen specimens which so perfectly agree in this respect except those I described as *confusa*. The punctuation of elytra is in some specimens very fine or almost absent, in others it is more distinct. The metascutellum is in a few specimens faint or invisible.

It is found in several localities in southern Arizona and Mexico.

***Boloschesis prosternalis* (Schaeffer).**

This species was originally described from Brownsville, Texas, but occurs also at Catalina Springs, Arizona (Hubbard and Schwarz in coll. U. S. N. M.) and at Acapulco, Mexico (Hoegel in coll. Brit. Mus.). It is the smallest of the species having a metascutellum and readily known by the different form of prosternum. There is also no yellow spot within the emargination of each eye and the black velvety space on each elytron usually seen in a certain light in the species with a metascutellum is absent in this species.

***Boloschesis insularis*, new species.**

Form of *gibbosa* Fab., color above and below and legs cupreous, labrum, a spot within the emargination of each eye and the first five antennal joints reddish, the last six joints black. Head very finely rugose, posteriorly punctate; antennae with fourth joint triangular, much narrower than the fifth joint. Prothorax similar to *gibbosa* but tuberosity more obliquely and less suddenly declivous; surface finely strigate-rugose, moderately coarsely punctate at sides; tuberosity divided into two sub-acute lobes, each lobe rather coarsely sub-rugose anteriorly. Elytra with tubercles as in *gibbosa*; surface rather coarsely punctate, intervals between the punctures convex, producing a somewhat sub-rugose appearance, surface otherwise, when visible between the punctures, finely rugose; metascutellum absent. Body below with large punctures. Prosternum narrow between the coxae, finely rugose and coarsely punctate. Claws broadly apiculate. Length, 3.75 mm.

Wilson City, Abaco, Bahama, June (Engelhardt).

Type.—Cat. No. 29465 U. S. National Museum.

This species is very similar to *gibbosa* but the prothoracic tuberosity is different, anteriorly more oblique and not as suddenly declivous and the two lobes are rather more acute, the outer six antennal joints are black and the elytral sculpture is rougher.

***Boloschesis quadrilobata*, new species.**

Small, similar to *tuberculata*, color dark cupreous, antennae, labrum, tarsi and tibiae in about apical half reddish. Head finely rugose, closely punctate

with moderately large punctures; between the eyes a fovea-like impression. Prothorax with a rather strong and sudden tuberosity, which latter is broadly canaliculate at its summit, dividing it into two lobes, at sides of each of the latter is a tubercle-like prominence and in front near the base of the tuberosity another rather prominent tubercle on each side of middle,¹ also a relatively large tubercle at sides equidistant from lateral margin and base; surface rather uneven, moderately finely strigate-rugose with relatively very large punctures, more numerous at sides than front. Elytra with the usual tubercles but the large median ones near suture nearer to the scutellum than in the other species, tubercles more or less confluent, the large median tubercle more or less distinctly connected with the smaller one below by a coarsely sculptured and moderately broad elevation, near the side margin, from about middle but not reaching to apex, a more or less distinct arcuate ridge; surface between the tubercles rather coarsely and sparsely punctuate; intervals between the punctures finely rugose; metascutellum absent. Prosternum rather finely rugose with moderate punctures which are well separated; narrow between the coxae. Pygidium with a fine, distinct longitudinal median carina; surface finely rugose with a few, more or less distinct tubercles and moderately large punctures. Body beneath with large punctures. Length, 3 mm.

San Antonio, Texas (Hubbard and Schwarz coll.).

Type and paratype.—Cat. No. 29466, U. S. National Museum.

This small species will be readily known from the other cupreous North American *Boloschesis* by the coloration of the tibiae and tarsi and the different sculpture of prothorax.

***Boloschesis gibbosus* (Fab.)**

Bruchus gibbosus Fab. 1777, 1781, 1787, 1792 and 1801.

Clythra plicata Fab, 1801.

Chlamys tuberosa Knoch, 1801.

Chlamys plicata (=gibbosa) Oliv. 1808.

The names *affinis* Klug, *assimilis* Klug and *polycocca* Lac, are wrongly placed as synonyms of *foveolata* Knoch in Mr. Leng's catalogue. They belong under *gibbosa* Fab.

B. gibbosa Fab. is a very variable insect in regard to the sculpture of prothorax and elytra. The strigation of the prothorax is in some specimens as coarse as in *cribripennis* Lac. and the sculpture of the elytra in certain specimens of *cribripennis* is very nearly as occasionally occurs in *gibbosa*. Some of these varieties are possibly referable to one or the other synonyms but I found it impossible to determine any of these with certainty from the descriptions.

¹These two frontal tubercles are scarcely visible from a frontal view, but are very distinct and rather prominent from a lateral or posterior view.

DESCRIPTION OF A NEW BRACONID PARASITE OF ARTONA CATOXANTHA (HYMENOPTERA).

BY S. A. ROHWER, *U. S. Bureau of Entomology.*

The description of the following new parasite is presented at this time so its name will be available to economic workers who are studying the life history, habits and control of the coconut pest, *Artona catoxantha* Hampson. The material from which this new species is described was forwarded by B. A. R. Gater, of the Department of Agriculture of Straits Settlements and Federated Malay States, accompanied by a letter stating that it is an important parasite of the early instars of its host and that efforts are being made to introduce it into Fiji to control *Levuana iridescens*.

***Apanteles artonae*, new species.**

Ovipositor short, hind legs except base of tibiae black, second tergite with oblique furrows, hind coxae opaque, granular.

Female.—Length 2 mm. Eyes very slightly converging towards the clypeus; face rather coarsely punctured, with a tendency to transverse striations, with rather distinct ridge below the bases of the antennae; vertex shining but with small punctures; antenna distinctly tapering apically, 18-jointed in type, the basal joints fully four times as long as their greatest width; mesoscutum with distinct, close, well-defined punctures; parapsides indicated posteriorly; suture in front of the scutellum broad, with four transverse rugae at the bottom; scutellum convex, with large punctures on the disk, the lateral face granular followed posteriorly by a somewhat polished area; propodeum with indistinct punctures medianly, with well-defined carina laterally, otherwise without carinae; mesepisternum shining, with distinct setigerous punctures; posterior coxae long, cylindrical, opaque, granular and with a few well-defined punctures interspersed; posterior tibiae longer than their femora and trochanters combined; first tergite slightly longer than its greatest apical width, indistinctly sculptured laterally, medianly smooth and shining; second tergite with two oblique furrows, the lateral area subopaque, the median area smooth and polished; following tergites polished; ovipositor short, about half as long as the first tergite; nervulus postfurcal by a distance somewhat greater than its length. Black; head and thorax covered with sparse white hair; sides of the first and second tergites ferrugineous; anterior legs, below the bases of the femora, ferrugineous but with the tarsi paler than the femora; base of posterior tibia ferrugineous; palpi sordid white; wings hyaline, distinctly iridescent, venation pale brown, costa and stigma dark brown.

Male.—Length 1.75 mm. Antenna not so distinctly tapering as in female; intermediate femora distinctly infuscate basally; first and second tergites very narrowly ferrugineous laterally; otherwise agrees with above characterization of the female.

Type locality.—Kuala Lumpur, Federated Malay States.

Type.—Cat. No. 40097, U. S. N. M.

Described from six females (one type) and nine males (one allotype) received from B. A. R. Gater, and said to be a parasite of the early stages of *Artona catoxantha*. Specimens recorded under his number 2603.

NOMINA CONSERVANDA FROM THE STANDPOINT OF THE TAXONOMIST.

BY W. L. MCATEE, *U. S. Biological Survey.*

Nomina conservanda have been adopted for the chief purpose of preserving familiar names. The action is equivalent to a ruling in the field of language that we shall continue to use the terms horseless carriage or flying machine and never change to such modern ones as automobile or airplane. Why do scientists, most of whom presumably are evolutionists, attempt to block development in taxonomy while constantly accepting change in other fields both within and without the domain of science?

Getting at the root of the thing, what virtue is there in familiarity? Certainly there is no real value in preserving a familiar name unless it embodies a definite concept. Proponents of nomina conservanda assume that these names do embody such concepts but this is a fallacy. In fact the longer a name has been in use the more we may be assured that authors have applied it to diverse organisms. The history of old names is very likely to be a chronicle of misidentifications.

Any one who has revised a taxonomic group knows this is true. He finds the same name label on different species, sometimes on several of them, and he finds different species (including undescribed ones) standing under a single name. If these things are true of collections, they are true also of literature which is based on collections. The plea that nomina conservanda preserve definite concepts, for the field of entomology at least, is ridiculous.

The definite concept idea is not retroactive; we can not consult the older writings and assume without great risk of error, when we find one of the conserved "familiar names" that it applies to the same organism assigned to it at present. Furthermore the definite concept idea has no anticipatory value, for we can not be insured against future change. Progress in taxonomy will not stop. Every successive reviser finds characters overlooked by his predecessors and refines the classification. Taxonomy is dynamic not static and its development demands never-ceasing perfecting of analysis and definition. Setting

up nomina conservanda is attempting to establish fixed entities in a field where change, where progress, necessarily has been the rule. It amounts to fixing limits to the search for knowledge—a wholly unscientific endeavor.

Nomina conservanda (in entomology at least) are the most tinsel of idols, and setting them up involves sacrifice of scientific ideals of evolution in methods and of progress in knowledge. Furthermore they can be established only by nullification of the fundamental principle of nomenclature, priority. Under the methods by which nomina conservanda are selected any name may be adopted or rejected by fiat.

This is anarchy which the taxonomist can not safely tolerate. To put the thing on the most selfish basis, taxonomists as a rule have as one of their chief objects building for themselves a monument from their works. When the names of the older systematists are handled with slight consideration by the commissions which promulgate nomina conservanda, how can the modern taxonomist expect better treatment for his names? It seems to the present writer that entomological taxonomists almost to a man will oppose nomina conservanda not only because of their futility but also because of their unfairness. Taxonomists originate the names, work with them more than other scientists, and in all ways have greater interests in them, and rights over them. Why, therefore, should taxonomists accept fiat names?

There would seem to be no compelling reason why fiat names should pretend to be terms recognized in technical taxonomy. Why will not standardized vernacular names serve every need of fiat nomenclature? Using vernaculars would certainly obviate otherwise inevitable conflict between believers and non-believers in nomina conservanda. If the proponents, however, will have pseudo-technical names, let them go their gait. Taxonomists can develop their own field according to their own best judgment, ignoring nomina conservanda which in consequence will eventually pass into the realm of forgotten things.

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THE SPECIES OF HÜBNER'S TENTAMEN.

BY WM. T. M. FORBES, *Ithaca, New York.*

Recent notices by the Commission of Zoological Nomenclature have called for an agreed bibliography of the specific names cited in Hübner's *Tentamen*. The following is presented to the public interested in that work, in the hope that it may serve this purpose.

Of the 107 names presented in the *Tentamen*, one is based on a species then unpublished, and so doubtless invalid; 74 are from Linnaeus, 64 first appearing in the tenth edition (or earlier as polynomials), 2 in the Museum of Louisa Ulrica, and four each in the Fauna Suecica and the 12th edition of the *Systema*. Four names are from Clerck's *Icones* (also appearing in Linnaeus), 7 are described in the Vienna Catalogue, usually credited to Denis and Schiffermüller, and one each from Cramer and Scopoli. Of names sometimes credited to the Vienna Catalogue, but which appear there as *nomina nuda*, one each appear to have been validated by description by Borkhausen and Hübner himself, and the twelve remaining are all described in Fabricius' "*Mantissa*" published in 1787. For some of these there may have been earlier references which have escaped me, but the Fabrician descriptions validate them in any case. Five names appear to have been first published by Hübner himself in the "*Sammlung Europ. Schm.*"

ORIGINAL REFERENCES FOR GENOTYPES PROPOSED IN THE
TENTAMEN.

I. PAPILIONES	I. <i>nymphales</i>	(VERZ NO.)
<i>Nerëis Polymnia</i> (Papilio Polymnia) Linn.		28
1764 Museum Ludovicae Ulricae, 224		
1767 Linn. Syst. Nat., ed. xii, Papilio No. 58 ¹ (<i>P. Heliconius</i>)		
(Preoccupied by Linnaeus, Syst. Nat., ed. x, 654, 1758.)		
<i>Limnas Chrysippus</i> (Papilio Chrysippus) Linn.		78
1764 Linn. Mus. Ludov. Ulr., 263		
1767 Linn. Syst. Nat., Ed. xii, Pap. 119 (<i>P. Danaus</i>)		

¹The Verzeichniss cites this as equal to *Heliconii* Linn. Does this automatically fix the type of both? We have been using *Heliconius* of another subfamily, but there seems to be evidence that this was the group *L.* especially intended.

<i>Lemonias Maturna</i> (Papilio Nymphalis ¹ Maturna Linn.)	223
1758 Linn. Syst. Nat., Ed. x, Pap. 136	
1767 Linn. Syst. Nat., Ed. xii, Pap. 204	
There are early references to <i>Lemonias</i> Illiger, but I can not find it was published before 1818.	
<i>Dryas Paphia</i> (Papilio Nymphalis Paphia Linn.)	266
1758 Linn. Syst. Nat., Ed. x, Pap. 138	
1768 Linn. Syst. Nat., Ed. xii, Pap. 209	
<i>Hamadryas Jo</i> (sic) (Papilio Nymphalis Jo Linn.)	322
1758 Linn. Syst. Nat., Ed. x, Pap. 88	
1767 Linn. Syst. Nat., Ed. xii, Pap. 131	
<i>Najas Populi</i> (Papilio Nymphalis Populi Linn.)	404
1758 Linn. Syst. Nat., Ed. x, Pap. 111	
1767 Linn. Syst. Nat., Ed. xii, 162	
<i>Potamis Iris</i> (Papilio Nymphalis Iris Linn.)	460
1758 Linn. Syst. Nat., Ed. x, Pap. 110	
1767 Linn. Syst. Nat., Ed. xii, 161	
<i>Oreas Proserpina</i> (Papilio Proserpina Schiff.)	459
1776 Denis and Schiffermüller Syst. Verz. der Schmetterlinge der Wiener Gegend, Plates 1a, 1b, Figs. 9a, b (<i>circe</i> Fabr. Syst. Ent., Pap. no. 226).	

II. *gentiles*

<i>Rusticus Argus</i> (Papilio Plebejus Argus Linn.)	670
1758 Linn. Syst. Nat., Ed. x, Pap. 152	
1767 Linn. Syst. Nat., Ed. xii, Pap. 232 ²	
<i>Princeps Machaon</i> (Papilio Eques Machaon Linn.)	844
1758 Linn. Syst. Nat., Ed. x, Pap. 27	
1767 Linn. Syst. Nat., Ed. xii, Pap. 33	
<i>Mancipium Brassicae</i> (Papilio Danaus Brassicae Linn.)	983
1758 Linn. Syst. Nat., Ed. x, Pap. 58	
1767 Linn. Syst. Nat., Ed. xii, Pap. 75	
<i>Consul Fabius</i> (Papilio Eques Achivus Fabius Cr.)	1058
1775 Cramer Papillons Exotiques I Pl. 90, C, D. ³	
<i>Urbanus Malvae</i> (Papilio Plebeius Malvae Linn.)	1191
1758 Linn. Syst. Nat., Ed. x, Pap. 167	
1767 Linn. Syst. Nat., Ed. xii, 267	

II. SPHINGES I. *papilionoides*

<i>Zygaena Filipendulae</i> (Sphinx Filipendulae Linn.)	1273
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¹In each case I cite Linnean genus and subgenus from the *Systema Naturae*. His numbering is continuous in each genus.

²There is apparently a little question which of two closely related species is the true *argus* L., but they are strictly congeneric and both were included in Linnaeus' conception.

³*Protopogonius* Hbn. Verz. is monotypical and would be a strict synonym.

1758 Linn. Syst. Nat., Ed. x, Sph. 32	
1767 Linn. Syst. Nat., Ed. xii, Sph. 34 ¹	
<i>Chrysaor Statices</i> (Sphinx Statices Linn.)	1293
1758 Linn. Syst. Nat., Ed. x, Sph. 38	
1767 Linn. Syst. Nat., Ed. xii, Sph. 47	
<i>Glaucopis Phegea</i> (Sphinx Phegea Linn.) ²	1318 n. b. l.
1758 Linn. Syst. Nat., Ed. x, Sph. 33	
1767 Linn. Syst. Nat., Ed. xii, Sph. 35	
(Preoccupied by Gmelin in Linn. Syst. Nat., ed. XIII, 363, 1788.)	

II. *hymenopteroides*

<i>Sphecomorpha Incendiaria</i> (nomen nudum) ³	
<i>Sesia Culiciformis</i> (Sphinx culiciformis Linn.)	
1758 Linn. Syst. Nat. Ed. x, p. 493, Sph. 29	
1767 Linn. Syst. Nat. Ed. xii, Sph. 30 ⁴	
<i>Thyris Pyralidiformis</i> (Sphinx Pyralidiformis Hbn.)	1399
date uncertain (1793-— ⁵). Hübner, Sammlung Europäische Schmetterlinge, Sphinxes p. 86, Pl. III, fig. 16.	
(synonym of <i>fenestrella</i> Scop.; <i>fenestrina</i> Den. and Schiff.)	

III. *legitimae*

<i>Bombylia Stellatarum</i> (Sphinx stellatarum Linn.)	1409
1758 Linn. Syst. Nat., Ed. x, Sph. 26	
1767 Linn. Syst. Nat., Ed. xii, Sph. 27	
<i>Eumorpha Elpenor</i> (Sphinx Elpenor Linn.)	1463
1758 Linn. Syst. Nat., Ed. x, Sph. 15	
1767 Linn. Syst. Nat., Ed. xii, Sph. 17	
<i>Manduca Atropos</i> (Sphinx Atropos Linn.)	1494
1758 Linn. Syst. Nat., Ed. x, Sph. 8	
1767 Linn. Syst. Nat., Ed. xii, Sph. 9	
<i>Amorpha Populi</i> (Sphinx Populi Linn.)	1517
1758 Linn. Syst. Nat., Ed. x, Sph. 2	
1767 Linn. Syst. Nat., Ed. xii, Sph. 2	

¹Fixes type of *Zygaena* Fabr. Syst. Ent. p. 550. 1775.

²Has priority over *Amata* Fabr. Illiger's Mag. vi, 289. The types though congeneric are wholly distinct. *Glaucopis* was taken up by F. in the same place, but without listing Hübner's type. (He also shifted the meaning of "*Pyralis*" in a similar way.)

³*Glaucopis Incendiaria* Hbn. was published 1827 according to Hampson, cat. Lep. Phal. i

⁴Fixes type of *Sesia* Fabr. Syst. Ent. p. 547, 1775.

⁵The text is dated 1796. This is *Thyris* Laspeyres, whose type (sole species) is the same species, cited by Laspeyres as *fenestrina*.

III. BOMBYCES I. *sphingoides*

<i>Dimorpha Versicolora</i> (Phal. Bombyx versicolora Linn.)	1526
1758 Linn. Syst. Nat., Ed. x, P. Bomb. 17 ¹	
1767 Linn. Syst. Nat., Ed. xii, P. Bomb. 32 ¹	
<i>Ptilodon Camelina</i> (P. B. camelina Linn.)	1542
1758 Linn. Syst. Nat., Ed. x, P. B. 56	
1767 Linn. Syst. Nat., Ed. xii, P. B. 80	
<i>Andria Vinula</i> (P. B. Vinula Linn.)	1559
1758 Linn. Syst. Nat., Ed. x, P. B. 16	
1767 Linn. Syst. Nat., Ed. xii, P. B. 29	
<i>Platypteryx Hamula</i> (Bombyx Hamula Schiffermüller) ²	1570
(Prelinnea) Réaum. vol. ii Mem. vi Pl. 22, figs. 407 (le cheval marin)	
1776 Den. and Schiff. Syst. Verz. Bombyx T. 4. proposes <i>Bombyx Hamula</i> for "le cheval marin" of Réaumur.	
1790 Borkhausen Naturg. d. Eur. Schmett. III, p. 57 no. 11 (also in Esper)	
1796 (?) Hübner Samml. Eur. Schm. II, Bombyces p. 114, figs. 46, 47	
<i>Echidna Tau</i> (P. Bombyx Tau Linn.)	1592
1758 Linn. Syst. Nat., Ed. x, P. B. 7	
1767 Linn. Syst. Nat., Ed. xii, P. B. 8	
(Preoccupied in the fishes by Forster 1778, and also in the Mammalia by Cuvier, 1797.)	

II. *veras*

<i>Heraea Carpini</i> (Bombyx Carpini Schiff.)	1638
(Prelinnea) Réaum. vol. 1, pl. 49, figs. 1-10. (le petit paon)	
(1758 Linn. Syst. Nat. P. B. 6 pavonia, α minor) (No. 7a of Ed. xii)	
1776 Den. and Schiff. Syst. Verz. Bombyx B. 3. proposes <i>Bombyx carpini</i> ³ for "le petit paon" of Réaumur.	
1796 (?) Hübner Samml. Eur. Schm. Pl. 14 figs. 53-54 (<i>carpini</i>)	
<i>Hipogymna</i> (sic) <i>Morio</i> (P. Bombyx Morio Linn.)	1644
1767 Linn. Syst. Nat., Ed. xii, P. B. 66	
<i>Leucoma Auriflua</i> (Bombyx Auriflua Fabr.)	1660
(1776 Den. and Schiff. Verz. Bombyx D. 4.—undescribed) ⁴	
1787 Fabr. Mantissa Insectorum ii, Bombyx No. 145	
<i>Dasychira Pudibunda</i> (P. Bombyx pudibunda Linn.)	
1758 Linn. Syst. Nat., Ed. x, P. B. 35	
1767 Linn. Syst. Nat., Ed. xii, P. B. 54	
<i>Melalopha Curtula</i> (P. Bombyx curtula Linn.)	1684
1758 Linn. Syst. Nat., Ed. x, P. B. 34	

¹All the species of *Phalaena* are numbered consecutively.²Fixes type of *Platypteryx* Laspeyres. Is a synonym of *Drepana* Schrank.³Ph. (for the Linnean *Phalaena*) appears in the center-heads; but the formal citation of the name is merely "B. Carpini," and so everywhere.⁴Name used by Stephens in another sense.

1767 Linn. Syst. Nat., Ed. xii, P. B. 52	
<i>Hipocrita</i> (sic) <i>Jacobaeae</i> (P. Noctua Jacobaeae Linn.)	1717
1758 Linn. Syst. Nat., Ed. x, P. N. 81	
1767 Linn. Syst. Nat., Ed. xii, P. N. 111	
<i>Hypercompe Caja</i> (P. Bombyx Caja Linn.)	1868
1758 Linn. Syst. Nat., Ed. x, P. B. 22	
1767 Linn. Syst. Nat., Ed. xii, P. B. 38	
<i>Lachneis Catax</i> (P. Bombyx Catax)	1909
1758 Linn. Syst. Nat., Ed. x, Appendix, p. 822	
1767 Linn. Syst. Nat., Ed. xii, P. B. 27	
<i>Trichoda Neustria</i> (P. Bombyx Neustria)	1974
1758 Linn. Syst. Nat., Ed. x, P. B. 19	
1767 Linn. Syst. Nat., Ed. xii, P. B. 35	
(preoccupied by <i>Trichoda</i> Müller, 1773)	
<i>Eutricha Quercifolia</i> (P. Bombyx quercifolia)	1951
1758 Linn. Syst. Nat. Ed. x, P. B. 8	
1767 Linn. Syst. Nat., Ed. xii, P. B. 18	
<i>Heteromorpha Caeruleocephala</i> (P. Bombyx caeruleocephala Linn.)	1989
1758 Linn. Syst. Nat., Ed. x, P. B. 38	
1767 Linn. Syst. Nat., Ed. xii, P. B. 59	

III. *fodicantes*

<i>Teredo Cossus</i> (P. Bombyx Cossus Linn.) ¹	1995
1758 Linn. Syst. Nat., Ed. x, P. B. 40	
1767 Linn. Syst. Nat., Ed. xii, P. B. 63	
<i>Hepiolus Humuli</i> (P. Noctua Humuli Linn.) ²	2017
1758 Linn. Syst. Nat., Ed. x, P. N. 62	
1767 Linn. Syst. Nat., Ed. xii, P. N. 84	

IV. NOCTUAE I. *bombycoides*

<i>Apatele</i> (sic) <i>Aceris</i> (P. Noctua Aceris Linn.)	2041
1758 Linn. Syst. Nat. Ed. x, P. N. 98	
1767 Linn. Syst. Nat., Ed. xii, P. N. 137	
<i>Diphihera Aprilina</i> (P. Noctua aprilina Linn.) ³	2050
1758 Linn. Syst. Nat., Ed. x, P. N. 99	
1767 Linn. Syst. Nat., Ed. xii, P. N. 138	

¹Preoccupied; Linn. Syst. Nat., Ed. x, p. 651.

²Fixes type of *Hepialus* Fabr. Syst. Ent. p. 589, 1775. Kirby also marks *humuli* as type of *Hepialus*, but Packard chose the blunt-winged species. Illiger also spells it "*Hepiolus*."

³This genus name has been in more or less continuous use, credited to Hübner. If the Tentamen is rejected, I do not know what will be its first valid use; perhaps Sammlung Exot. Schmett., Pl. 193, for *Noropsis hieroglyphica*, a South American form of an entirely different group.

III. BOMBYCES I. *sphinxoides*

<i>Dimorpha Versicolora</i> (Phal. Bombyx versicolora Linn.)	1526
1758 Linn. Syst. Nat., Ed. x, P. Bomb. 17 ¹	
1767 Linn. Syst. Nat., Ed. xii, P. Bomb. 32 ¹	
<i>Ptilodon Camelina</i> (P. B. camelina Linn.)	1542
1758 Linn. Syst. Nat., Ed. x, P. B. 56	
1767 Linn. Syst. Nat., Ed. xii, P. B. 80	
<i>Andria Vinula</i> (P. B. Vinula Linn.)	1559
1758 Linn. Syst. Nat., Ed. x, P. B. 16	
1767 Linn. Syst. Nat., Ed. xii, P. B. 29	
<i>Platypteryx Hamula</i> (Bombyx Hamula Schiffermüller) ²	1570
(Prelinnea) Réaum. vol. ii Mem. vi Pl. 22, figs. 407 (le cheval marin)	
1776 Den. and Schiff. Syst. Verz. Bombyx T. 4. proposes <i>Bombyx Hamula</i> for "le cheval marin" of Réaumur.	
1790 Borkhausen Naturg. d. Eur. Schmett. III, p. 57 no. 11 (also in Esper)	
1796 (?) Hübner Samml. Eur. Schm. II, Bombyces p. 114, figs. 46, 47	
<i>Echidna Tau</i> (P. Bombyx Tau Linn.)	1592
1758 Linn. Syst. Nat., Ed. x, P. B. 7	
1767 Linn. Syst. Nat., Ed. xii, P. B. 8	
(Preoccupied in the fishes by Forster 1778, and also in the Mammalia by Cuvier, 1797.)	

II. *veras*

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(Prelinnea) Réaum. vol. 1, pl. 49, figs. 1-10. (le petit paon)	
(1758 Linn. Syst. Nat. P. B. 6 pavonia, a minor) (No. 7a of Ed. xii)	
1776 Den. and Schiff. Syst. Verz. Bombyx B. 3. proposes <i>Bombyx carpini</i> ³ for "le petit paon" of Réaumur.	
1796 (?) Hübner Samml. Eur. Schm. Pl. 14 figs. 53-54 (<i>carpini</i>)	
<i>Hipogymna</i> (sic) <i>Morio</i> (P. Bombyx Morio Linn.)	1644
1767 Linn. Syst. Nat., Ed. xii, P. B. 66	
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1787 Fabr. Mantissa Insectorum ii, Bombyx No. 145	
<i>Dasychira Pudibunda</i> (P. Bombyx pudibunda Linn.)	
1758 Linn. Syst. Nat., Ed. x, P. B. 35	
1767 Linn. Syst. Nat., Ed. xii, P. B. 54	
<i>Melalopha Curtula</i> (P. Bombyx curtula Linn.)	1684
1758 Linn. Syst. Nat., Ed. x, P. B. 34	

¹All the species of *Phalaena* are numbered consecutively.²Fixes type of *Platypteryx* Laspeyres. Is a synonym of *Drepana* Schrank.³Ph. (for the Linnean *Phalaena*) appears in the center-heads; but the formal citation of the name is merely "B. Carpini," and so everywhere.⁴Name used by Stephens in another sense.

1767 Linn. Syst. Nat., Ed. xii, P. B. 52	
<i>Hipocrita</i> (sic) <i>Jacobaeae</i> (P. Noctua <i>Jacobaeae</i> Linn.)	1717
1758 Linn. Syst. Nat., Ed. x, P. N. 81	
1767 Linn. Syst. Nat., Ed. xii, P. N. 111	
<i>Hypercompe Caja</i> (P. Bombyx <i>Caja</i> Linn.)	1868
1758 Linn. Syst. Nat., Ed. x, P. B. 22	
1767 Linn. Syst. Nat., Ed. xii, P. B. 38	
<i>Lachneis Catax</i> (P. Bombyx <i>Catax</i>)	1909
1758 Linn. Syst. Nat., Ed. x, Appendix, p. 822	
1767 Linn. Syst. Nat., Ed. xii, P. B. 27	
<i>Trichoda Neustria</i> (P. Bombyx <i>Neustria</i>)	1974
1758 Linn. Syst. Nat., Ed. x, P. B. 19	
1767 Linn. Syst. Nat., Ed. xii, P. B. 35	
(preoccupied by <i>Trichoda</i> Müller, 1773)	
<i>Eutricha Quercifolia</i> (P. Bombyx <i>quercifolia</i>)	1951
1758 Linn. Syst. Nat. Ed. x, P. B. 8	
1767 Linn. Syst. Nat., Ed. xii, P. B. 18	
<i>Heteromorpha Caeruleocephala</i> (P. Bombyx <i>caeruleocephala</i> Linn.)	1989
1758 Linn. Syst. Nat., Ed. x, P. B. 38	
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III. *fodicantes*

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<i>Hepiolus Humuli</i> (P. Noctua <i>Humuli</i> Linn.) ²	2017
1758 Linn. Syst. Nat., Ed. x, P. N. 62	
1767 Linn. Syst. Nat., Ed. xii, P. N. 84	

IV. NOCTUAE I. *bombycoides*

<i>Apatele</i> (sic) <i>Aceris</i> (P. Noctua <i>Aceris</i> Linn.)	2041
1758 Linn. Syst. Nat. Ed. x, P. N. 98	
1767 Linn. Syst. Nat., Ed. xii, P. N. 137	
<i>Diphthera Aprilina</i> (P. Noctua <i>aprilina</i> Linn.) ³	2050
1758 Linn. Syst. Nat., Ed. x, P. N. 99	
1767 Linn. Syst. Nat., Ed. xii, P. N. 138	

¹Preoccupied; Linn. Syst. Nat., Ed. x, p. 651.

²Fixes type of *Hepialus* Fabr. Syst. Ent. p. 589, 1775. Kirby also marks *humuli* as type of *Hepialus*, but Packard chose the blunt-winged species. Illiger also spells it "*Hepiolus*."

³This genus name has been in more or less continuous use, credited to Hübn. If the *Tentamen* is rejected, I do not know what will be its first valid use; perhaps *Sammlung Exot. Schmett.*, Pl. 193, for *Noropsis hieroglyphica*, a South American form of an entirely different group.

- Jaspidia Spoliatricula* (P. Noctua Spoliatricula Hübner) 2061
1799 Hübner. Samml. Eur. Schmett. Noctua 26.¹

II. *genuinae*

- Miselia Oxyacanthae* (P. Noctua Oxyacanthae Linn.) 2069²
1758 Linn. Syst. Nat., Ed. x, P. N. 113
1767 Linn. Syst. Nat., Ed. xii, P. N. 165
Pyrophyla (sic) *Pyramidea* (P. Noctua pyramidea Linn.) 2081
1758 Linn. Syst. Nat., Ed. x, P. N. 119
1767 Linn. Syst. Nat., Ed. xii, P. N. 181
Polia Flavicincta (Noctua flavicincta Fabr.)³ 2107
1776 Den. and Schiff. Syst. Verz. Noct. H. 2.—(undescribed)
1787 Fabr. Mantissa Insect., Noctua 277
Achatia Atriplicis (P. Noctua Atriplicis Linn.) 2203
1758 Linn. Syst. Nat., Ed. x, P. N. 116
1767 Linn. Syst. Nat., Ed. xii, P. N. 173
Graphiphora Gothica (P. Noctua gothica Linn.) 2248
1758 Linn. Syst. Nat., Ed. x, P. N. 107
1767 Linn. Syst. Nat., Ed. xii, P. N. 159
Agrotis Segetis (P. Noctua Segetum Schiff.)⁴ 2280
1775 Schiff. Syst. Verz. Noctua N. 12, Pl. 1a, 1b, fig. 3.
Glaea (sic) *Vaccinii* (Ph. Noctua Vaccinii Linn.) 2318
1761 Linn. Fauna Suecica No. 1212
1767 Linn. Syst. Nat. Ed. xii, P. N. 166
Xanthia Fulvago (Ph. Noctua Fulvago Linn.) 2344
1761 Linn. Fauna Suecica no. 1173
1767 Linn. Syst. Nat., Ed. xii, P. N. 190
Cosmia Affinis (P. Noctua affinis Linn.)⁵ 2351
1767 Linn. Syst. Nat., Ed. xii, P. N. 144
Bombycia Or (Noctua or Fabr.) 2358
(1776 Den. and Schiff. Syst. Verz. Noctua T. 5.—undescribed)
1787 Fabricius Mantissa Insect. N. 202

¹Is *Bryophila algae* of later authors according to Staudinger and Rebel. The name appears in the Wiener Verzeichniss, but without description.

²In the text of the Verzeichniss it is misprinted "Oxiocanthae," but is correct in Geyer's index.

³This name was taken up by Ochsenheimer and Treitschke and has been in continuous use. If the Tentamen is not accepted it may be a very difficult matter to determine the type of later uses. Tr. included *flavicincta*, Hampson chose *cappa*, a member of another subfamily.

⁴This name was taken up by Ochsenheimer, and it is frequently credited to him.

⁵This name was taken up by Ochsenheimer, and is frequently credited to him, but with a different type (*paleacea*, I think).

<i>Heliophila Pallens</i> (P. <i>Noctua pallens</i> Linn.)	2390
1758 Linn. Syst. Nat. Ed. x, P. N. 77	
1759 (so given in Fauna Suecica) Clerck Icones Pl. 4, fig. 6	
1767 Linn. Syst. Nat. Ed. xii, P. N. 107	
<i>Xylena</i> (sic) <i>Lythoxylea</i> (P. <i>Noctua lithoxylea</i> Fabr.)	2416
(1776 Den. and Schiff. Syst. Verz. Noct. K. 2.—undescribed)	
1787 Fabr. Mantissa Insect. P. N. <i>lithoxylea</i> no. 299 ¹	
<i>Tribonophora</i> (sic) <i>Umbratica</i> (P. <i>Noctua umbratica</i> Linn.)	2445
1758 Linn. Syst. Nat., Ed. x, P. N. 103	
1767 Linn. Syst. Nat., Ed. xii, P. N. 150 ²	
<i>Plusia Chrysitis</i> (P. <i>Noctua Chrysitis</i> Linn.)	2496
1758 Linn. Syst. Nat., Ed. x, P. N. 90	
1767 Linn. Syst. Nat., Ed. xii, P. N. 126	
<i>Erotyla Sulphurea</i> (P. <i>Noctua Sulphurea</i> Schiff.)	2509
1767 Linn. Syst. Nat., Ed. xii, P. <i>Pyalis Sulphuralis</i> No. 333	
1775 Schiff. Syst. Verz. Noc. Z. 6. proposes <i>sulphurea</i> as a substitute name for <i>sulphuralis</i> , under the custom of the time, as the ending —alis was restricted to the <i>Pyalides</i> , and Schiff. transfers it to the <i>Noctuidae</i> . ³	
<i>Antophila</i> (sic, but <i>Anthophilae</i>) <i>Purpurina</i> (N. <i>purpurina</i> Fabr.)	2527
(1776 Den. and Schiff. Syst. Verz. Noc. T. 9.—undescribed)	
1787 Fabr. Mantissa Insect. N. 215	
<i>Heliothis Dipsacea</i> (P. <i>Noctua dipsacea</i> Linn.)	2578
1767 Linn. Syst. Nat., Ed. xii, P. N. 185 ⁴	
<i>Ascalapha Lunaria</i> (P. <i>Noctua lunaris</i> Fabr.)	2621
(1776 Den. and Schiff. Syst. Verz. Noc. Aa. 1.—undescribed)	
1787 Fabr. Mantissa Insect. P. <i>Noctua</i> 135	
<i>Lemur Maura</i> (P. <i>Noctua maura</i> Linn.)	2711
1758 Linn. Syst. Nat., Ed. x, P. N. 88	
1767 Linn. Syst. Nat., Ed. xii, P. N. 124	
(preoccupied by <i>Lemur</i> Linnaeus, Syst. Nat., Ed. x, 1758)	
<i>Blepharum Sponsa</i> (P. <i>Noctua sponsa</i> Linn.)	2726
1767 Linn. Syst. Nat., Ed. xii, P. N. 118	
<i>Brephos Parthenias</i> (P. <i>Noctua Parthenias</i>)	2745
1761 Linn. Fauna Suecica No. 1160	
1767 Linn. Syst. Nat., Ed. xii, P. N. 94	

¹Was taken up by Ochsenheimer. Later it was emended to *Xylina*, and has been constantly used with this spelling.

²The spelling is an obvious misprint, and is corrected in the Verzeichniss Bek. Schm. to *Tribunophorae*. It should not be confused with the *Trigonophorae* of the Wiener Verz.

³A synonym of *Emmelia trabealis* (Scop.)

⁴This name was taken up by Ochsenheimer and has been in continuous use to include *dipsacea*, save for Hampson, who ignores the Tentamen and uses the "first species rule" in selecting types.

- Euclidia Glyphica* (P. *Noctua glyphica*) 2752
 1758 Linn. Syst. Nat., Ed. x, P. N. 76
 1767 Linn. Syst. Nat., Ed. xii, P. N. 105¹

V. GEOMETRAE I. *amplae*

- Hylaea Fasciaria* (P. *Geometra fasciaria*) 2766
 1758 Linn. Syst. Nat., Ed. x, P. G. 142
 1759 (?) Clerck Icones Pl. 5, fig. 6 (?) (so cited in L. Ed. xii)
 1767 Linn. Syst. Nat., Ed. xii, P. G. 216
Terpne Papilionaria (P. *Geometra papilionaria* Linn.) 2779
 1758 Linn. Syst. Nat., Ed. x, P. G. 151
 1767 Linn. Syst. Nat., Ed. xii, P. G. 225
Eusarca Elinguaria (P. *Geometra elinguaria* Linn.) 2802
 1758 Linn. Syst. Nat., Ed. x, P. G. 137
 1767 Linn. Syst. Nat., Ed. xii, P. G. 211
Lars Sambucaria (P. *Geometra Sambucaria* Linn.) 2820
 1758 Linn. Syst. Nat., Ed. x, P. G. 129
 1767 Linn. Syst. Nat., Ed. xii, P. G. 203
Eutrapela Lunaria (P. *Geometra Lunaria* Schiff.) 2836
 1776 Den. and Schiff. Syst. Verz. Geo. F. 7, Pl. 1a, 1b, fig. 4
Erastria Amataria (P. *Geometra amataria* Linn.) 2904
 1758 Linn. Syst. Nat., Ed. x, P. G. 158 (amata).
 1767 Linn. Syst. Nat., Ed. xii, P. G. 201 (amataria)
 (the name was first changed in the Fauna Suecica no. 1223)

II. *tenues*

- Cyclophora Pendularia* (Phalaena pendularia (Clerck?)) 2915
 1759 (?) Clerck Icones Pl. 7, fig. 5
 1761 Linn. Fauna Suecica No. 1244 (cites "Icones")
Spilote Grossulariata (P. *Geometra Grossulariata* Linn.) (-aria) 2937
 1758 Linn. Syst. Nat., Ed. x, P. G. 167
 1767 Linn. Syst. Nat., Ed. xii, P. G. 242
Sphecodes Pusaria (P. *Geometra pusaria* Linn.) 2982
 1758 Linn. Syst. Nat., Ed. x, P. G. 150
 1767 Linn. Syst. Nat., Ed. xii, P. G. 223
Chleuastes Piniaria (P. *Geometra Piniaria* Linn.) 2878
 1758 Linn. Syst. Nat., Ed. x, P. G. 134
 176- Clerck Icones Pl. 1, fig. 10
 1767 Linn. Syst. Nat., Ed. xii, P. G. 210
Sciadion Fuvata (Phalaena fuvata Fabr.)² 3019
 (1776 Den. and Schiff. Syst. Verz. Geo. I. 1.—undescribed)
 1787 Fabr. Mantissa Insect. Phalaena No. 120
Cymatophora Roboraria (Phalaena roboraria Fabr.) 3043
 (1776 Den. and Schiff. Syst. Verz. Geo. D. 1.—undescribed)
 1787 Fabr. Mantissa Insect. Phal. No. 23

¹Taken up by Ochsenheimer and in continuous use.²Fabr. prints with a *u*, but also in "Larvae lizidae." He uses *v* in "vndata."

III. *aequivocae*

<i>Pachys Prodromaria</i> (Phal. prodromaria Fabr.)	3072
(1776 Den. and Schiff. Syst. Verz. Geo. C. 1.: name proposed for "la printanière" of Geoffroy. I can find no such name in Geoffroy, and suppose it must have been unpublished)	
1787 Fabr. Mantissa Insect. Phal. 87 ¹	
<i>Epirrita Dilutata</i> (Geometra Dilutata Borkhausen)	3100
1794 Borkh. Naturgesch. vol. 5, p. 290, 564	
(date?) Hübner Samml. Eur. Schm. Geometrae Pl. 36. fig. 188	
<i>Rheumaptera Hastata</i> (P. Geometra hastata Linn.)	3169
1758 Linn. Syst. Nat., Ed. x, P. G. 180	
1759 (?) Clerck Icones Pl. 1, fig. 9	
1767 Linn. Syst. Nat., Ed. xii, P. G. 254	
<i>Hydria Undulata</i> (P. Geometra undulata Linn.)	3182
1758 Linn. Syst. Nat., Ed. x, P. G. 164	
1759 (?) Clerck Icones Pl. 6, fig. 3	
1767 Linn. Syst. Nat., Ed. xii, P. G. 239	
<i>Petrophora Moeniata</i> (Phalaena Moeniata Scop.)	—
1763 Scopoli Ent. Carn. 226, No. 561 (Moeniata)	
1776 Den. and Schiff. Syst. Verz. Geo. M. 1. (Moeniaria)	

VI. PYRALIDES I. *geometrifformes*

<i>Erpyzon Barbalis</i> (P. Pyralis Barbalis Cl.)	3295
1759 (?) Clerck Icones Pl. 5. fig. 3	
1767 Linn. Syst. Nat., Ed. xii, Phal. 329 (small b)	
<i>Salia Salicalis</i> (Pyralis Salicalis Schiff.)	3293
1776 Den. and Schiff. Syst. Verz. Pls. la, lb, fig. 5.	

II. *vulgares*

<i>Helia Purpuralis</i> (P. P. purpuralis Linn.)	3344
1758 Linn. Syst. Nat., Ed. x, P. P. 233	
1759? Clerck Icones Pl. 9, fig. 10	
1767 Linn. Syst. Nat., Ed. xii, P. P. 342	
<i>Elophila Limnalis</i> (P. Geometra Lemnata Linn.)	3468
1758 Linn. Syst. Nat., Ed. x, P. G. 199 (Lemnata)	
1767 Linn. Syst. Nat., Ed. xii, P. G. 278 (Lemnata)	
1776 Den. and Schiff. Syst. Verz. Pyr. B. 30. (Lemnalis) ²	
<i>Palpita Urticalis</i> (P. Geometra urticata Linn.)	3451
1758 Linn. Syst. Nat., Ed. x, P. Geometra 195 (Hortulata) ³	
1761 Linn. Fauna Suecica no. 1297 (urticata) ³	
1767 Linn. Syst. Nat., Ed. xii, P. G. 272 (urticata)	

¹According to Staudinger and Rebel is a synonym of *strataria* Hufnagel.

²*Limnalis* was an obvious misprint. The change from *lemnata* to *lemnalis* was in accordance with the custom of the time.

³The two citations have identical bibliographic references.

III. *difformes*

- Idia Bombycalis* (Phalaena bombycalis Fabr.) 3321
 (1776 Den. and Schiff. Syst. Verz. Pyr. A. 6.—undescribed)
 1787 Fabr. Mantissa Insect. Phal. 268
- Chlamiphora Palliola* (P. palliolalis Hbn.) 3845
 (1776 Den. and Schiff. Syst. Verz. Noct. D. 1.—undescribed)
 17—Hübner Samml. Eur. Schmett. pyral. f. 149¹ (palliolalis)

VII. TORTRICES I. *lascivae*

- Hemerophila Pariana* (P. Tortrix pariana Clerck) 3575
 17—Clerck Icones Pl. 10, fig. 9
 1767 Linn. Syst. Nat. Ed. xii, P. Tortrix 320
- Olethreutes Arcuana* (P. Tinea Arcuella Clerck) 3586
 17—Clerck Icones Pl. 10, fig. 8
 1767 Linn. Syst. Nat., Ed. xii, Phal. 296
- Archips Oporana* (P. Tortrix oporana Linn.) 3775
 1758 Linn. Syst. Nat., Ed. x, P. T. 207
 1767 Linn. Syst. Nat., Ed. xii, P. T. 292

II. *pigrae*

- Nycteola Degenerana* (P. Tortrix Degenerana Hbn.) 3837
 1793–1827 Hübner Samml. Eur. Schmett. Tortrix 8
- Pseudoips Quercana* (x. Tortrix Quercana Schiff.) 3843
 (Prelinnean) Geoffroy Histoire Abreges des Insectes vol. 2, p. 172 no. 124 “la chappe verte a bande.”
 1776 Den. and Schiff. Syst. Verz. Tor. A. 1. proposes the name *quercana* for “la Chappe verte a bande” of Geoffroy.
- Cochlidion Testudo* (Bombyx Testudo Fabr.) 3850
 (1776 Den. and Schiff. Syst. Verz. Bom. V. 1.—undescribed)
 1787 Fabr. Mantissa Insect., Bombyx no. 116

VIII. TINEAE I. *certae*

- Canephora Graminella* (Tinea Graminella Schiff.) 3854
 1764 Geoff. Hist. abr. des Insectes ii, 203 no. 51; “la teigne à fourreau de paille composé.”
 1776 Den. and Schiff. Syst. Verz. p. 133, 291, proposes the name Graminella for “la teigne à fourreau de paille composé.”
 1793–1827 Hübner Samml. Eur. Schm. Tin. 1²
- Enyphantes Gelatella* (P. Tinea Gelatella Linn.)
 1761 Linn. Fauna Suecica no. 1450

¹I think there is no doubt in fact of this equation; Hübner having changed the name of the species on transferring it to the Pyralids, in accordance with the rule of the time. It is a synonym of *culculatella* Linn. Tinea no. 258 (ed. xii, no. 376), and has also been placed in the old genus Tortrix.

²Listed as a synonym of *vestitella* (*vestita* esp.) in the Verzeichniss. Given as a synonym of *unicolor* Hufn. by Staud. and Rebel.

176- Clerck Icones Pl. 8, fig. 5 (congelatella)	
1767 Linn. Syst. Nat., Ed. xii, P. T. 344	
<i>Brosis Granella</i> (P. Tinea granella Linn.)	3890
1758 Linn. Syst. Nat., Ed. x, P. T. 259	
1767 Linn. Syst. Nat., Ed. xii, P. T. 377	
<i>Ses Pellionella</i> (P. Tinea pellionella Linn.)	3869
1758 Linn. Syst. Nat., Ed. x, P. T. 254	
1767 Linn. Syst. Nat., Ed. xii, P. T. 372	

II. *incertae*

<i>Tetrachila Conchella</i> (Tinea Conchella Fabr.)	3489?
(1775 Schiff. Syst. Verz. Tinea B. 6.—undescribed)	
1787 Fabr. Mantissa Insect. Tinea 30 ¹	
<i>Hyphantes Evonymella</i> (P. Tinea Evonymella Linn.)	3984
1758 Linn. Syst. Nat., Ed. x, P. T. 239	
1767 Linn. Syst. Nat., Ed. xii, P. T. 350	

III. *mirabiles*

<i>Elasmion Geerella</i> (P. Tinea DeGeerella L.)	4031
1758 Linn. Syst. Nat., Ed. x, P. T. 286	
176- Clerck Icones Pl. 12, fig. 3 (degeerella)	
1767 Linn. Syst. Nat., Ed. xii, P. T. 426 (DeGeerella)	
<i>Coleophora Anatipennella</i> (P. T. Anatipennella Hübner.)	4175
1796 (?) Hübner Samml. Eur. Schmett. Tinea 186	
<i>Phyllonorycter Rajella</i> (P. Tinea Rajella Linn.)	4118
1758 Linn. Syst. Nat., Ed. x, P. T. 298	
1767 Linn. Syst. Nat., Ed. xii, P. T. 447	

IX. ALUCITAE I. *indubidatae* (sic)

<i>Pterophora Pentadactyla</i> (P. A. pentadactyla Linn.)	4194
1758 Linn. Syst. Nat., Ed. x, P. A. 304	
1767 Linn. Syst. Nat., Ed. xii, P. A. 459 ²	
<i>Ripidophora Hexadactyla</i> (P. Alucita hexadactyla Linn.)	4196
1758 Linn. Syst. Nat., Ed. x, P. A. 305	
1767 Linn. Syst. Nat., Ed. xii, P. A. 460	

THE BRONZED CUTWORM (NEPHELODES EMMEDONIA CRAMER) (LEPIDOPTERA).

By S. E. CRUMB, U. S. Bureau of Entomology.

The mature larva of the bronzed cutworm is described rather fully in the following pages as a contribution toward a classifi-

¹It is uncertain apparently to which of two closely related species this name belongs.

²Fixes type of *Pterophorus* Geoffroy, of which it is an obvious emendation.

cation of noctuid larvae, since this is the only representative of the genus reported from the United States. The other early stages of this common species apparently have not been previously described.

LARVA.

SIXTH INSTAR (MATURE) LARVA.

In this larva the body is dark brown with a bronzy sheen; there are 3 broad, sharply defined, dorsal pale lines; and the head is concolorous with the dorsum. A remarkable anatomical feature is the absence of seta IIc on the prothorax. This is present a little posterior to seta Ic in all other noctuid larvae which the writer has examined.

Head 4.2 to 4.5 mm. broad. Body about 35 to 45 mm. long and 9 mm. broad; broadening gradually posteriorly to the seventh abdominal segment; skin set closely with small, dark, isolated, round, nearly flat, shining granules; general color dark brown with a distinct bronzy sheen, distinctly paler ventrally. A broad sharply defined but subdued middorsal pale line. Similar broader subdorsal lines. An ill-defined pale line including setigerous tubercle III. A broad waxy white band below the spiracles. Spiracles black. Setigerous tubercles minute, their arrangement as in figure 1. Claw of leg with the base broadly rounded, not at all angulate. Each anterior proleg with about 10 stout crochets. Head concolorous with the dorsum with faint darker reticulation, the ocelli unusually small, III and IV widely separated. Cervical shield black, shining, with 3 equal pale lines. Anal shield black with 3 pale lines.

Mouth Parts.—Spinneret scarcely twice as long as broad, the lateral margins nearly parallel, the apical margin simple, convex (fig. 3). Labial palpus with the segments in the proportionate length of 22 (basal), 4.5, and 16.5. The apical papilla on the basal segment twice as long as the second segment (fig. 5). Mandible large, heavy, with 5 rather ill-defined teeth (fig. 2). Hypopharynx with the fore part densely clothed with spines, much coarser laterally. Lobes of the maxillulae and gorge set sparsely throughout with rather coarse spines. Free margin of the blade of the maxillulae with about 13 coarse, rather short, flat, triangular, toothlike processes. Two of the three setae on the first segment of the maxillary palpus strap-shaped with pointed tips.

Head Setae and Punctures (figs. 4, 6, 7).—A² approximately equidistant from A¹ and A³; A² somewhat nearer to A³ than to A¹; A² decidedly nearer to A¹ than to P^a; A² apparently normally about equidistant from A² and A³; A^a nearer to A² than to P^a; A³ slightly less than the ocellar width from ocellus II; line joining the bases of A³ and O² passes through ocellus I; interspace A²—A^a somewhat less than P¹—P^a; P^a, A^a and A² (also A³) not approximately in a straight line; P² decidedly nearer to Adf² than to Adf¹ and distinctly above the level of Adf²; Adf² twice as near to P¹ as to P²; P^b twice as near to P² as to P¹; Adf^a about twice as near to Adf² as to Adf¹; Adf² far above the apex of the front; F^a on the line of F¹; O¹ on the line connecting the centres of ocelli IV and VI; O² slightly nearer to A³ than to O¹; O² decidedly nearer to A³ than to L¹; O^a less than the ocellar width from ocellus VI and nearer to VI than to O³; ocellus VI slightly nearer to O¹ than to O²—sometimes equidistant; L¹

about 3 times as near to L^a as to O^2 ; SO^a distinctly anterior to SO^3 , and 3 or more times as near to SO^3 as to SO^2 ; SO^3 slightly nearer to G^1 than to O^2 ; G^1 distinctly nearer to O^3 than to SO^3 ; G^a approximately equidistant from G^1 and O^3 ; G^1 distinctly nearer to G^a than to O^3 ; G^1 minute.

FIFTH INSTAR LARVA.

Head 3 mm. broad. Body about 27 mm. long and 5 mm. broad, gradually enlarging posteriorly. Coloration as in the mature larva with the pale stripes somewhat more prominent.

FOURTH INSTAR LARVA.

Head 2.1 mm. broad. Body about 16 mm. long and 3.5 mm. broad, tapering gradually from the metathorax posteriorly; skin set with minute slightly isolated granules; general color green, finely obscurely flecked with pale, including the venter. With narrow subdued middorsal, subdorsal and subspiracular pale bands, the band below the spiracles suffused with purplish. A deeper green in a band above the spiracles. Head greenish flecked with pale fuscous. Cervical and anal shields concolorous with adjacent parts. Spiracles black. Tubercles and their setae inconspicuous.

THIRD INSTAR LARVA.

Head 1.2 mm. broad. Body about 13 mm. long and 1.5 mm. broad, tapering from the mesothorax to the blunt posterior extremity; skin set with inconspicuous small, rounded, fuscous granules; general color bright green with subdued white middorsal, subdorsal and subspiracular bands, the latter including a band of purplish. Head white flecked with fuscous. Cervical and anal shields concolorous with adjacent parts.

SECOND INSTAR LARVA.

Head 0.81 mm. broad. Body about 5 mm. long and 1 mm. broad, tapering gradually to the blunt posterior extremity; skin set very closely with fine longitudinal granules having fuscous borders and somewhat more closely massed along the white markings, upon which they are obsolete; general color pale olivaceous with prominent middorsal, subdorsal, and subspiracular stripes and a pair of lines above the spiracles, white. Spiracles black. Setigerous tubercles of body small, fuscous, their setae brown, about one-ninth the length of an abdominal segment, very slightly enlarged apically. Head white, very conspicuously closely freckled with dark fuscous. Cervical and anal shields nearly concolorous with adjacent parts, flecked with dark fuscous.

FIRST INSTAR LARVA.

Head 0.51 mm. broad. Body about 3 to 5 mm. long and 0.5 mm. broad, gradually tapering from the prothorax posteriorly; skin set dorsally and ventrally with conspicuous, coarse, isolated, rounded, brown, granules; general color whitish to pale olivaceous with middorsal, subdorsal and a pair of supra-spiracular lines white, distinct, and a broad white band below the spiracles.

Spiracle dark. Setigerous tubercles all of about equal size, small, dark, their setae heavy, clavate, brown, about one-fifteenth the length of an abdominal segment. Legs pale, the apical segment infuscated. Functional prolegs on abdominal segments 3, 4, 5, 6 and 10. Head pale brown with slightly darker close-set freckles. Cervical shield distinct, brownish with dark margins. Anal shield distinct, large semicircular.

PUPA.

Pupa about 23 mm. long and 8 mm. broad, wing cases and appendage cases coarsely rugulose, spiracles narrow, somewhat oblique, anterior third of movable abdominal segments finely, closely punctured, cremaster a cylindrical process longitudinally rugulose, bearing apically two rather short stout spines.

EGG.

Egg round in outline, broadly elliptical in profile, 0.93 mm. broad and 0.77 mm. high, with about 250 minute ribs which bear very minute isolated papillae, transverse lines not noticeable. A few days after deposition the upper half of the egg becomes more or less marked with pale pink which changes shortly to plumbeous. Eggs deposited October 3 were dissected December 11 and contained fully developed but nearly motionless larvae.

Eggs deposited in September and October do not hatch until January or February, and hatching may continue over a considerable period in eggs which were deposited on the same night. Three larvae hatched on January 20, 1917, from a lot of eggs deposited September 28, 1916, which had been kept outdoors in a moist sunny place. Much snow was on the ground at this time at Clarksville, Tennessee, where these observations were made, and the weather had only just begun to moderate after a protracted cold spell during which the temperature fell to near zero on several occasions. Larvae which hatched on January 31 when the mercury stood at 70° Fahrenheit were subjected almost at once to a falling temperature and on the night of February 2, the temperature fell to 5° Fahrenheit. Although these larvae had had no food since hatching they were still alive on February 8.

It is difficult to conceive of any great advantage the species gains by subjecting this grass-feeding larva to the hardships which its hatching period impose upon it, but it is evident that these larvae possess remarkable qualifications for meeting these difficulties.

DISTRIBUTION.

This species has been reported in some cases as occurring throughout the United States east of the Rocky Mountains, but the records available to the writer indicate that it is limited to the northern portion of this region, with Colorado, Kansas,

Missouri, Tennessee and Virginia marking the approximate southern limit of its range.

FOOD PLANTS.

The larva has a marked preference for grasses and cereal plants as food, but it has been reported as feeding on the buds and leaves of fruit trees.

SEASONAL HISTORY.

The following observations on the seasonal history of the bronzed cutworm are based on conditions at Clarksville, Tennessee. This is a one-brooded species. Larvae begin to mature and enter the soil early in April, and most of them have ceased their activity by early in May, although some are occasionally found until the latter part of May. These larvae, after a long resting period, begin pupating in July, and moths begin to make their appearance about the middle of September and continue on the wing until about the middle of October. Eggs deposited in September and October hatch in January and February.

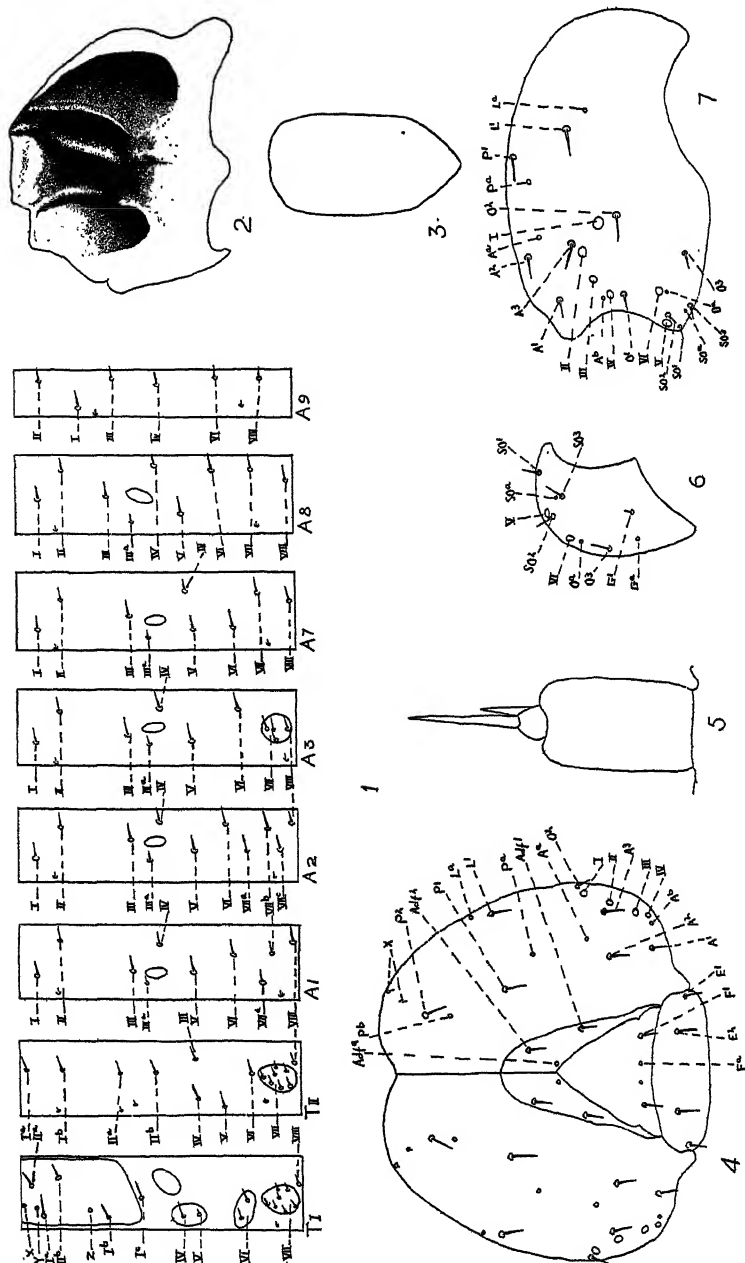
In common with a large group of single-brooded species of the cutworm type, the bronzed cutworm has a period of retarded development in its seasonal history. These species tend to be of northern distribution, and the higher average temperature encountered as they advance into more southern latitudes tends to shorten the time necessary for the completion of the cycle of development. In order that the various features of the seasonal history may be fixed as to seasonal occurrence, the life cycle must be made to occupy a full year. This is accomplished, in the group under consideration, by prolonging the period of retarded development as the species advances southward to compensate for the tendency toward acceleration in development.

This retardation rarely occurs in the adult, but all of the other stages of the insect are utilized commonly in one or another of the species. In the case of the bronzed cutworm, retardation occurs in both the larval and egg stages, about six months of the year being spent in a quiescent state in northern Tennessee.

One surprising result of this slowing-up of the activities of the insect as it advances southward is that the moths emerge in northern Tennessee distinctly later than they do in Canada¹ or Illinois.² It will be readily seen that there must be a definite

¹GIBSON, A.—1915. "Cutworms and Their Control," Bulletin No. 10, Entomological Branch, Dept. of Agriculture, Canada, p. 29.

²FORBES, S. A.—1904. "The More Important Insect Injuries to Indian Corn," Bull. No. 95, Univ. Illinois Ag. Ex. Sta., p. 360.



CRUMB—THE BRONZED CUTWORM.

limit to the period which the species can occupy in a quiescent state, and therefore there may be a definite southern limit beyond which the species can not maintain itself owing to this fact and owing possibly to abnormalities in the period of emergence as indicated above.

EXPLANATION OF PLATE 2.

Fig. 1.—*Nephelodes emmedonia*: Setal maps of first and second thoracic and first, second, third, seventh, eighth and ninth abdominal segments of larva.

Fig. 2.—*Nephelodes emmedonia*: Mandible of larva.

Fig. 3.—*Nephelodes emmedonia*: Spinneret of larva.

Fig. 4.—*Nephelodes emmedonia*: Head capsule of larva, dorsal view showing arrangement of setae and punctures.

Fig. 5.—*Nephelodes emmedonia*: Labial palpus of larva.

Fig. 6.—*Nephelodes emmedonia*: Head capsule of larva, ventral view of right side, showing arrangement of setae and punctures.

Fig. 7.—*Nephelodes emmedonia*: Head capsule of larva, lateral view, showing arrangement of setae and punctures.

Explanation of Symbols applied to Larva.

A¹, A², A³, A^a, A^b=anterior setae and punctures of epicranium.

Adf¹, Adf², Adf^a=adfrontal setae and punctures of epicranium.

E¹, E²=epistomal setae.

F¹, F^a=frontal seta and puncture.

G¹, G^a=genal seta and puncture of epicranium.

L¹, L^a=lateral seta and puncture of epicranium.

O¹, O², O³, O^a=ocellar setae and puncture of epicranium.

P¹, P², P^a, P^b=posterior setae and punctures of epicranium.

SO¹, SO², SO³, SO^a=subocellar setae and puncture of epicranium.

X=ultraposterior setae of epicranium.

I, II, III, IV, V, VI=ocelli.

NORTH AMERICAN BEES OF THE GENUS PANURGINUS.

By J. C. CRAWFORD, *North Carolina Department of Agriculture.*

Work of this group of bees was begun several years ago in Washington and is based on the collection of the U. S. National Museum, where the types of the species described in this paper as new are deposited. To this material there is added a species taken during work on the project of a Biological survey of North Carolina.

The key to species includes all those known to the author which are described in the male sex, but two varieties of *P. clypeatus* based on antennal and venational characters are not included.

Genus **PANURGINUS** Nylander.

Synonym.—*Greeleyella* Cockerell,
Birkmania (sic) Viereck.

Although the genotype of *Panurginus* is not well known, in Europe many species have been assigned to this genus. Apparently they are correctly placed and if so, the American species formerly put in the genus *Greeleyella* must be transferred to *Panurginus*. The European subgenus *Epimethia* and also *P. hispanicus* will, I think, have to be excluded. The American species formerly referred to the genus must, as stated by Mr. Charles Robertson, be placed in *Pseudopanurgus*.

Panurginus Nyl. Auct. is easily recognized by the first recurrent vein being either subinterstitial or received by the first cell near apex or by the second cell almost at base. In *Pseudopanurgus* the first recurrent is received by the second cell far from base. In the males of *Panurginus* the eighth sternite is expanded apically and the sixth, which is heavily chitinized has an apical cavity usually bounded by a carina for the reception of the expanded portion of the eighth sternite; in *Pseudopanurgus* the sixth sternite is thin, almost membranous and medially deeply emarginate or cleft almost to base.

The following key is based on pinned specimens and it should be noted, regarding the process on the sixth sternite, that, in *morrisoni*, it appears much more preapical than when mounted in balsam; also that in *nigrellus* it seems much more deeply emarginate. As the sixth, seventh and eighth sternites show good specific characters, they are illustrated for all the species known to me.

Key to the Males.

1. Face entirely black.....2.
 Clypeus, at least in part, light color.....4.
2. Mesoscutum dull, strongly reticulately lineolated practically all over; process on 6th sternite partly preapical, strongly elevated, slightly emarginate apically, sides strongly reflexed.....*morrisoni*, n. sp.
 Mesoscutum weakly reticulately lineolated only anteriorly, rest smooth and shiny; process of 6th sternite caudad of posterior margin and appearing deeply emarginate apically, sides not strongly reflexed.....3.
3. Process of 6th sternite deeply emarginate, the prongs subparallel thickened and truncate apically.....*nigrellus*, n. sp.
 Process not deeply emarginate (though appearing so in dry specimens), prongs widely divergent and rounded apically.....*atriceps* Cress.
4. All tibiae yellow.....*beardsleyi* Ckll.
 Tibiae dark, at most a yellow stripe on front and hind pair.....5.
5. Mesonotum strongly lineolate, almost impunctate.....*potentillae* Cwfd.
 Mesonotum not distinctly lineolate, distinctly punctured.....6.
6. Mark on clypeus not reaching upper margin and usually confined to a transverse band near apical margin.....*atramontensis*, n. sp.

Panurginus nigrellus, new species (Fig. 7).

Male.—Length, 6 mm. Similar to the two preceding species but differentiated as indicated in the key; third antennal joint no longer than fifth; mandibles about as in *atriceps*.

Type and 5 paratypes with the record, near Stanford University, California, Strawberry Bend, Corte Madero Creek, April 11, 1915, Harold Morrison, Collector.

Additional specimens as follows:

Near Stanford University, California, Corte Madero Creek, April 4, 1915, Harold Morrison, Collector, 5 specimens; near Stanford University, California, Corte Madero Creek, April 11, 1915, Harold Morrison, Collector, 2 specimens; Corte Madero Creek, May 12, 1915, R. Stinchfield, Collector, on flowers of *Arbutus menziesii*; 1 specimen; near Stanford University, California, Canyon, lower end, April 4, 1915, Harold Morrison, Collector, 1 specimen.

Panurginus beardsleyi (Cockerell) (Fig. 10).

Synonymy.—*Greeleyella beardsleyi* Cockerell.

Panurginus malvastri Cockerell and Swenk.

This is a species in which the sternites are modified to a remarkable degree.

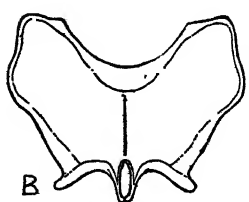
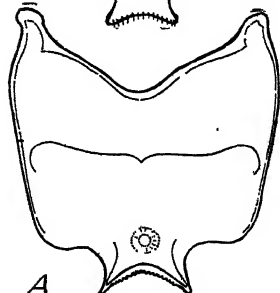
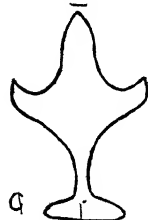
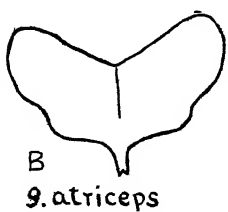
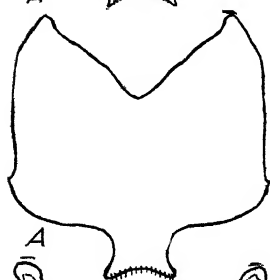
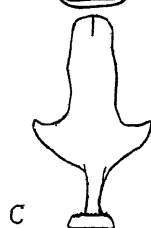
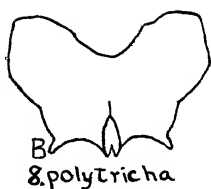
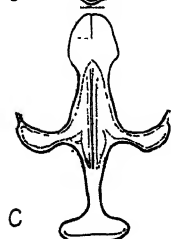
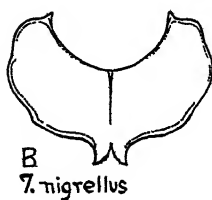
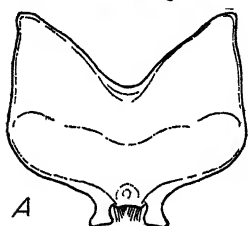
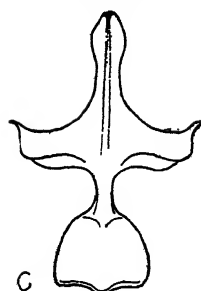
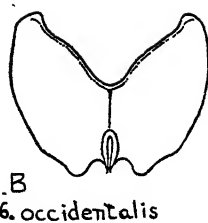
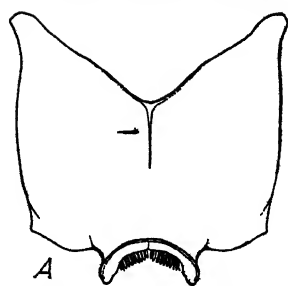
Panurginus potentillae (Crawford) (Fig. 2).

Synonymy.—*Greeleyella potentillae* Crawford.

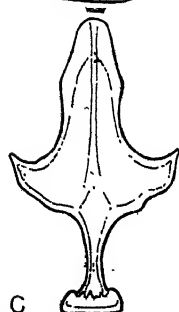
The range of this species is considerably extended by the taking of specimens at Raleigh, N. C., and at Bryson City, N. C. Whenever accompanied by flower records, they are always shown to be found on *Potentilla*.

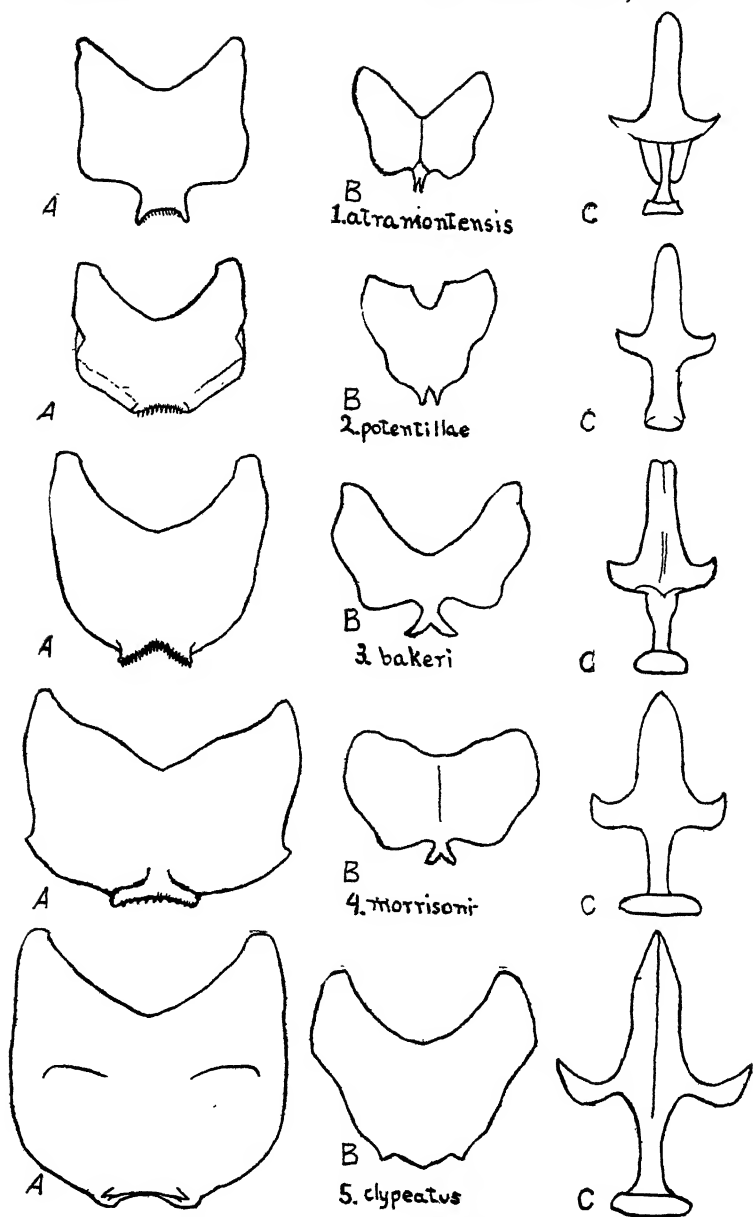
Panurginus atramontensis, new species (Fig. 1).

Type, male. Length, 5 mm. Black, shining, head and thorax thinly clothed with long glittering white pubescence; head with scattered weak punctures; face below antennae smooth; above insertion of antennae tessellate and sparsely punctured, tessellation fading out towards orbits and above eyes where it is entirely smooth and sparsely punctured, as are cheeks; clypeus with a transverse light yellowish mark near apex (in certain paratypes this mark expanded above so as to be triangular); antennae long, about reaching propodeum, flagel reddish beneath; mesonotum polished, sparsely punctured, pleurae tessellated, with scattered fine punctures; base of propodeum with a few irregular rugae reaching apex, rest of surface of propodeum finely tessellate; tegulae dark with a large dark testaceous spot; wings slightly yellowish, stigma and nervures brown, the first and second recurrent nervures received slightly before the transverse cubiti (in some paratypes the first recurrent almost interstitial); legs black, knees and basal joint of fore and mid tarsi ivory color, basal joint of hind tarsi ivory color with a dark brown stripe behind (in certain paratypes practically all brown); apical tarsal joints testaceous; abdominal tergites beyond the first



10. beardsleyi





smooth, polished and practically impunctate; first segment, finely tessellated and with fine, scattered punctures, very thinly clothed with short white hairs.

Female. Length, 6 mm. Similar to the male, except in secondary sexual characters and with the pubescence distinctly ochraceous; face entirely black, as is the basal joint of all tarsi but second to fourth tarsal joints very light testaceous; face with a tessellated area below the insertion of each antennae; mesoscutum tessellated along all margins, most apparent at anterior lateral angles; second recurrent nervure practically interstitial.

Type locality.—Swannanoa, N. C.

Described from nine males and one female taken by the author on June 9 and 11, 1924, the type pair in coitu.

Although a careful search was made in the vicinity in which this material was taken flying, no specimens could be found on any flower.

Panurginus polytricha Cockerell (Fig. 8).

Synonym.—*Birkmania andreoides* Viereck.

The National Museum contains a long series of this species from the C. F. Baker collection, from Louisiana.

Panurginus occidentalis (Crawford) (Fig. 6).

Synonym.—*Greeleyella occidentalis* Crawford.

I have seen no material except the original.

Panurginus bakeri, new species (Fig. 3).

Male. Length, 6 mm. Black with long glittering white pubescence; clypeus lemon yellow; face below antennae shiny, sparsely punctured, above satiny from fine roughening; antennae reddish beneath, third joint subquadrate, hardly longer than fourth; mesonotum smooth, shiny, sparsely punctured; pleurae, finely lineolated, shiny; propodeum finely rugulose; tegulae dark; wings brownish; veins dark brown; first recurrent vein received by second cubital cell near base, or subinterstitial; legs dark, a stripe on front of fore tibiae, mid knees, basal joint of all tarsi and *a stripe on under side of hind tibiae at base*, lemon yellow; small joints of tarsi becoming more reddish; abdomen somewhat brownish, shiny, sparsely punctate, first segment almost impunctate; process of 6th sternite bearded apically.

Type locality.—Colorado.

Described from 5 specimens from the C. F. Baker collection with the following Baker numbers: 1580, 1581, 1582, 2019.

Similar to *clypeatus* Cresson but differing in the apical ventral plates and easily recognized by the yellow mark on lower edge of hind tibiae at base.

Panurginus clypeatus (Cresson) (Fig. 5).

Synonym.—*Calliopsis clypeata* Cresson.

The variety *calochorti* Ckll. is based on specimens with dark antennae and *verus* Ckll. on specimens with "the deeper mar-

ginal cell, rounded instead of angled at its upper apical corner and the second abdominal segment more closely and evidently punctured."

***Panurginus armaticeps* Cockerell.**

This species is unknown to me in the male sex.

EXPLANATION OF PLATE 12.

- Fig. 1.—*Panurginus atramontensis* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.
 Fig. 2.—*Panurginus potentillae* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.
 Fig. 3.—*Panurginus bakeri* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.
 Fig. 4.—*Panurginus morrisoni* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.
 Fig. 5.—*Panurginus clypeatus* (Cresson): a, 6th sternite; b, 7th sternite; c, 8th sternite.

EXPLANATION OF PLATE 13.

- Fig. 6.—*Panurginus occidentalis* (Crawford): a, 6th sternite; b, 7th sternite; c, 8th sternite.
 Fig. 7.—*Panurginus nigrellus* Crawford: a, 6th sternite; b, 7th sternite; c, 8th sternite.
 Fig. 8.—*Panurginus polytricha* Cockerell: a, 6th sternite; b, 7th sternite; c, 8th sternite.
 Fig. 9.—*Panurginus atriceps* (Cresson): a, 6th sternite; b, 7th sternite; c, 8th sternite.
 Fig. 10.—*Panurginus beardsleyi* (Cockerell): a, 6th sternite; b, 7th sternite; c, 8th sternite.

NEW CACTUS BEETLES.

By W. S. FISHER, *U. S. Bureau of Entomology.*

The beetles described below were obtained in connection with the prickly-pear insect investigations that are being conducted by the Commonwealth of Australia at Uvalde, Texas, and were sent for identifications by Leith F. Hitchcock. Mr. Hitchcock is anxious to have names for these species to use in papers dealing with cactus insects.

***Moneilema (Moneilema) nigriventris*, n. sp.**

Form elongate, moderately convex, only slightly ventricose, and the surface subopaque, black, except the elytra which have a feeble reddish tinge, and each elytron ornamented with an obsolete vitta of very short, white hairs extending from the middle to the apex.

Head slightly depressed between the antennal tubercles, sparsely, minutely punctate, with a few coarser punctures toward the sides, and sparsely clothed with very short, inconspicuous pubescence; clypeal suture impressed, but abbreviated at the sides; antennae about three-fourths as long as the body, rather robust, and gradually tapering to the apex; first joint long, robust, acute externally at apex, and the surface with a few widely separated punctures; fourth joint broadly annulated with whitish pubescence at base, and joints three to five with more or less whitish pubescence on the under side.

Pronotum about one-fourth wider than long, the sides nearly parallel and very unevenly arcuate, and without trace of visible tubercle or spine; sparsely, irregularly punctate over entire surface, and the punctures becoming coarser and denser toward the sides.

Elytra nearly two times as long as wide, regularly oblong-oval, widest near middle, strongly convex, and the flanks rounded and not very abruptly deflexed; sides very broadly rounded at humeral angles, and broadly, transversely sinuate at the tips; surface with feeble, broad, wavy, longitudinal lines (more distinct in female), coarsely, irregularly punctate on basal half, the punctures becoming obsolete on apical half, and somewhat scabrous on the deflexed area near base.

Abdomen feebly convex, smooth, and nearly impunctate; last ventral segment entirely black, broadly, arcuately emarginate at the apex in the male, and broadly rounded in the female; last dorsal segment uniformly black. Legs smooth and not distinctly punctate, and the femora of the female much less inflated than in the male; both sexes with the first three joints of anterior tarsi spongy pubescent beneath; first joint of posterior tarsi not spongy pubescent beneath, the second and third densely so throughout though divided by a very fine line.

Length, male 15 mm., female 20 mm.; width, male 6.5 mm., female 8 mm.

Type locality.—Texas Panhandle (between Dumas and Stratford).

Type and allotype.—Cat. No. 29363, United States National Museum.

Described from two specimens, male type and female allotype collected at the type locality during June, 1926, by Leith F. Hitchcock.

This species is closely allied to *appressa* Leconte, but can be at once distinguished from that species by the entirely black fifth dorsal and ventral abdominal segments, which are more or less red in *appressa*. The labrum is also black in *nigriventris* and not red as in *appressa*.

***Moneilema (Collapteryx) mexicanum*, n. sp.**

Form small, elongate, moderately convex, only slightly ventricose, and the surface glabrous, feebly shining, and uniformly black.

Head rather deeply but obtusely depressed between the antennal tubercles, rather densely, minutely punctate, and with a few vague, coarse punctures in-

termixed; clypeal suture feebly impressed; antennae about two-thirds as long as the body, moderately robust, and gradually tapering to the apex; first joint long, robust, not at all armed, truncate and widest at apex, and densely, minutely punctate; fourth joint feebly, broadly annulated with whitish pubescence at base.

Pronotum only slightly wider than long, the sides nearly parallel, and armed with a short, obtuse tubercle just behind the middle; surface smooth, impunctate, except for a few deep punctures in front of the scutellum.

Elytra nearly one and three-fourths times as long as wide, oblong-oval, widest near middle, strongly convex, and the flanks rounded and not very abruptly deflexed; sides obtusely rounded at humeral angles, and very broadly rounded at the tips; surface obsoletely wavy, coarsely, irregularly punctate except on sutural region posteriorly, and the punctures deeply impressed and widely separated.

Abdomen feebly convex, nearly impunctate, and clothed with a few short, inconspicuous hairs; last segment entirely black, and broadly, arcuately emarginate at the apex. Legs robust, gradually expanded toward the apex, and the surface with a few coarse, vague punctures; first three joints of anterior tarsi spongy pubescent beneath; first joint of posterior tarsi spongy pubescent at the sides, the second and third spongy pubescent throughout.

Length, 13 mm.; width, 5 mm.

Type locality.—Pachuca, Mexico.

Type and paratype.—Cat. No. 29365, United States National Museum.

Described from two males (one type) collected at the type locality during May, 1926.

This species is closely allied to *crassa* Leconte, but it is smaller, more slender, and the pronotum has only a few punctures in front of the scutellum.

***Moneilema (Collapteryx) punctipennis*, n. sp.**

Form short and robust, moderately convex, strongly ventricose, and the surface glabrous, moderately shining, and uniformly black.

Head rather deeply but obtusely depressed between the antennal tubercles, rather densely, minutely punctate, with a few deep, coarse punctures intermixed, especially toward the sides, and clothed with a few short, inconspicuous hairs; clypeal suture deeply impressed, and with a few coarse punctures from which arises a long, stiff, black hair; antennae about two-thirds as long as the body, robust, and strongly tapering to the apex; first joint long, robust, cylindrical, gradually expanded to the apex, which is unarmed, and finely, minutely punctate, with a few shallow, coarse punctures intermixed; joints not distinctly annulated with whitish pubescence.

Pronotum about one-fourth wider than long, the sides nearly parallel, unevenly arcuate, and armed with a distinct short, obtuse tubercle just behind the middle; surface smooth, densely minutely punctate, with a row of deep, coarse punctures along base, and a few widely scattered, coarse, shallow punctures over the surface.

Elytra about one and one-half times as long as wide, oblong, strongly convex, strongly deflexed behind the middle, the flanks abruptly deflexed and vertical; sides nearly rectangular at humeral angles, vaguely, arcuately expanded to near middle, then arcuately narrowed to the tips, which are conjointly, broadly rounded; surface densely, very coarsely punctate except for a small area near the apex, the punctures deep and more or less confluent toward the sides.

Abdomen rather strongly convex, obsoletely punctate, and clothed with a few short, inconspicuous hairs; last segment entirely black, and feebly, broadly, arcuately emarginate at the apex. Legs robust, rather strongly expanded toward the apex, and the surface with a few coarse, vague punctures; coxae ornamented with a distinct spot of densely placed, yellowish white pubescence; first three joints of anterior tarsi spongy pubescent beneath; first joint of posterior tarsi spongy pubescent at the sides apically, the second and third densely so throughout though divided by a very fine line.

Length, 15 mm.; width 6 mm.

Type locality.—Tehuacan, Puebla, Mexico.

Type and paratypes.—Cat. No. 29364, United States National Museum.

Described from three males (one type) collected at the type locality, April 29, 1926, by Leith F. Hitchcock. The specimens examined are quite variable in size, measuring from 12 to 17 millimeters in length, and 5 to 8 millimeters in width.

This species can be distinguished from all other described species of this genus by its having a nearly smooth pronotum and very coarsely, deeply punctured elytra.

***Cactophagus spinolae rubronigrum*, new variety.**

This form is similar to the variety *validus* Leconte in all respects except color. The body above and beneath is of a distinct reddish black color, whereas in *validus* it is uniformly black.

Length, 20-22 mm.; width, 7.5-8.5 mm.

Type locality.—Tehuacan, Puebla, Mexico.

Type and paratypes.—Cat. No. 29366, United States National Museum. Two paratypes returned to Mr. Hitchcock.

Described from six examples (one type) collected at the type locality, April 29, 1926, by Leith F. Hitchcock. At first this form was considered merely as an immature specimen of *validus*, but recently Mr. Hitchcock submitted more material, and in a letter stated that 15 specimens were collected, and that all of the adults seen in that locality were reddish black. Since this seems to be a good color form, and so far as known, restricted to a certain region, it should at least have a new varietal name.

A NEW SATYRID FROM CHINA (LEPIDOPTERA).By W. SCHAU, *U. S. National Museum.****Palaeonympha avinoffi*, new species.**

Female.—Palpi white, the second joint with lateral black points, the third with a black streak above, both with long fringe of black and white hairs in front. Thorax black. Abdomen white with transverse black lines. Wings pale olive buff with a very fine terminal black line, the cilia white, dark shaded at base. Fore wing: costa finely black; traces of a double subterminal grayish line; an outer row of oval black spots between veins 2 and 6, the spot above vein 2 small and round. Hind wing: an outer row of five round black spots, the spots at each end reduced to points. Wings underneath: the basal half citrine drab, its edge slightly sinuous, the outer half white; the spots larger with bluish white points on fore wing, and white spots on hind wing; the spots on hind wing broadly edged with cream white and then by a fine lunular dark line; a straighter dark line surrounds the group of spots on fore wing; a dark subterminal line irrorated with silver scales.

Expanse, 38 mm.

Habitat.—Mowchow, Szechuen, China.*Type*.—Cat. No. 33125, U. S. N. M.

Collected by D. C. Graham at an elevation of 3000 ft. in July.

Another female has the wings white, the dark basal half of underside more noticeable in transparency; the ocelli reduced in size, the subterminal and terminal lines more conspicuous. On the underside of hind wing the ocelli margined with maize yellow.

Expanse, 42 mm.

Named in honor of Mr. A. Avinoff, Director of the Carnegie Museum.

Actual date of publication, January 15, 1927.

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